An Interesting Article on Fan Theory on pages 601-605

COAL AGE

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COAL AGE

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C. E. LESHER, *Editor*

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Fair and Timely Warning

RAILROAD activity exceeding anything so far recorded is forecast by the American Railway Association in an announcement issued last week. Taking time by the forelock the railroad executives have outlined and agreed upon a program that calls for a reduction in bad-order cars and locomotives to normal by Oct. 1, for a minimum of road construction and maintenance after Sept. 1 and that stocks of railroad fuel coal for next winter be put in the ground by Sept. 1. Above all in interest to the coal industry, however, is the implication that a car shortage is on the way and that it will be of huge proportions next autumn unless many things are done.

The warning is timely and fair. The roads are expending something over $1,500,000,000 for equipment and betterments in two years and they may fairly ask the shipping public to co-operate with them in meeting the transportation needs of the country. Between Jan. 1, 1922, and March 1, 1923, the roads of the country have purchased and there have been delivered to them 117,280 new freight cars and 2,106 new locomotives. More than 100,000 more cars and 1,000 locomotives are on order and will be delivered by Oct. 1, 1923. The railroad executives believe that they are doing their utmost to prepare themselves for the deluge of traffic that they see coming. They ask the country to help.

It is quite true, as pointed out by the *Railway Age*, that "there is very good reason for believing that as the activity of business increases the shortage of transportation will be felt more actively than ever before, because it is far greater than any but a few people realize." The shortage has been with us since the coal strike was terminated last August, and because it affects all kinds of freight it is a factor to be considered in forecasting the program this year of general business expansion. There may be, as has been pointed out, a definite relation between available transportation and credit expansion, for if producers of manufactured goods cannot make deliveries they must increase their loans to carry stocks, or curtail production.

Literal fulfillment of the agreement among the railroads to complete their normal proper stocking program of fuel coal by Sept. 1 will have its effect on the soft-coal trade this summer. A fuel coal consumption of 400,000 tons per day, or 150,000,000 tons per year, is indicated by the present and expected railroad activity. Thirty days' supply—a fair normal average for winter—by Sept. 1 means at least the doubling of present stocks, or the addition of 6,000,000 tons this summer. If the roads should get their stocking program well under way within the next thirty days, they would have fifteen weeks remaining for its completion, or an average of 400,000 tons per week of storage coal to originate, move and put down. Such an increment to the usual summer requirements of the country will help hold up the rate of production.

This tonnage will be on contract and negotiation of fuel-coal contracts is well under way. Some of the largest buyers, as the New Haven and the New York Central, have been closing contracts during the past week. An early decision of the Interstate Commerce Commission on the assigned-car case will facilitate the buying program, particularly if it be in the direction of restricting this method of getting fuel coal.

The railroads urge the public to buy and store coal this summer. The Federal Fuel Distributor gives the same advice, likewise the U. S. Coal Commission. The navy purposes, as an example, to put some 200,000 tons into stock at once. If buyers, particularly the railroads and large industrials, take advantage of their opportunities this summer and get a large part of next winter's coal off the rails, they will most certainly have more transportation for their products and less car shortage than if they do otherwise. The incentive is not so great nor the reason so clear as that which preceded the accumulation of huge reserves prior to April 1, 1922, but it is before us nevertheless.

Virtuous Indignation at Brophy

JOHN BROPHY, president of district No. 2 of the United Mine Workers, is not popular at headquarters. That is quite apparent from the last issue of the *United Mine Workers' Journal*. His friends on the outside, who have supported his drive against the non-union fields in Somerset County, his nationalization program and his general liberal policies are cartooned as riding for a fall. The *Journal* vigorously assails the tactical error of his legal representative in declaring before the Interstate Commerce Commission that the mine workers would accept a 20-per cent reduction in wages if the assigned car were abolished. At the same time Brophy's lone efforts to continue the strike in Somerset County get no support from the official organ of the union.

It happens that Brophy is acknowledged by many as the strongest opponent of John L. Lewis, which explains much, inasmuch as Lewis may be supposed to control the policy of the *Journal*. Brophy is a real "liberal," and to the following he has attained on that account are to be added those who go along because they are opposed to Lewis, among whom are such as Farrington and Howat.

Intermingled with the shafts aimed at Brophy, the *Journal*, editorially and in its news columns, stresses the law-abiding character of the miners' union. To break the law or any man's head is farthest from its purpose, it seems. Ellis Searles' letter to John Brydon, of the operators' association, makes it clear that were there to be any measure of violence in Somerset County, which is in Brophy's jurisdiction, it would be no fault of the International union—far from that headquarters to countenance trouble! One can almost see the finger pointing at Brophy, who is at least suspected of having

"reds" about him. Indianapolis with much show of virtue declares that it will have no reds in its ranks.

But why pick on Brophy in this fervor of spring housecleaning? Lewis' drive on the reds in his organization and the double repudiation of the acts of Brophy are converging. One may be pardoned for suspecting that Brophy is to be made the goat. And yet what has he done? Was the Herrin massacre in district No. 2? Was the Cliftonville episode in Somerset County? Did Brophy engineer the Willis Branch attacks or command the armed march on Logan County?

So far as we know, the only laws that Brophy and his liberal-minded friends would violate are economic laws. The gentle folk who hold his radical views—or should we say, whose radical views he holds?—are more given to the use of the pen than the gun. They seek not to destroy the law but to make it all in their favor. The spotlighting of Brophy cannot make us forget the bloody happenings that occurred outside of central Pennsylvania and Somerset County.

Business Cycles and the Coal Industry

NO ONE is more affected by and has less actual control over the business cycle, the ebb and flow of prosperity than the coal man, particularly the producer of soft coal. None therefore will be more interested in knowing that there is some ground for hope that that elusive thing inflation of which is concurrent with the bubble of unwarranted prosperity, is in some measure controllable and that a sober unheated study has been made with recommendations for its control.

Whether the methods recommended by the eminent committee that made the study for the President's Committee on Unemployment, the summary of which has recently been published by the Department of Commerce, will, if followed, serve to flatten out the peaks and fill the valleys of industrial activity, is a matter on which opinions may differ.

Among the proposed remedies—which include control of credit expansion, of inflation, of public construction, unemployment reserve funds and public employment bureaus—that with respect to control of private construction bears especially on the soft-coal industry. It is true, as stated, that "few subjects in recent years have attracted more attention from business men than the stabilization of business operations." It is axiomatic that the operation of coal mines at uniform rates throughout the year and from year to year is more satisfactory and in the end more profitable than going by fits and starts. But the coal man has little or no control over the factors that influence the demand for his product. Car shortage puts the brake on his operations at times of peak demand but lack of market serves as no buffer to prevent him from hitting the bottom. Where the coal companies as individuals may become factors in controlling the business cycle is in respect to extension of plant—that is, of mine capacity.

Beyond question the capacity of the bituminous-coal mines today is well in advance of the capacity of the railroads to move the coal to market or the country to consume the coal. Yet there is witnessed today a steady increase in plant capacity; new mines are being projected, built and started into production apparently with no regard for actual market requirements and presumably with no sounder justification than that other mines have been operated at a profit.

What happens to an overdeveloped industry in the way of idle capital and unemployment of workers is nowhere better illustrated than in soft coal.

Aside from the small influence exerted on the general situation by the equipping of coal mines at times of high prices and on the peak of the cycle, it must be conceded that the soft-coal industry is more the victim of business cycles than it is or can be the cause.

At Last We Know

MYSTERIOUS no longer is the origin of coal. Prof. Barton Scammell, president of the Radium Institute, at its meeting at Dover, England, asserted that he had discovered where it comes from and how it comes to be as it is. He has been making researches into the composition of the lava from Mt. Vesuvius, which is being used as a fertilizer, and he asserts that this led him to the discovery that the layers of "bind"—the "mysterious substance found on the top and bottom of all coal seams," according to the Associated Press—are identical in analysis with lava.

In both he finds the lime, iron, magnesium, potash and other elements required by plant life. On this slim ground, Professor Scammell says, we are told, that coal is a cellulose of trees and vegetable matter carbonized by hot lava, and sunk at a remote period into the depths of the earth by disturbances of the crust of the latter. So at last are all our mysteries solved.

The only difficulty is to know where first to prick a hole in Professor Scammell's bubble. Does he seriously believe that vegetable matter could be laid on hot lava without being burned? Can he tell how the vegetable matter grew in the hot lava or how it was spread in a more or less even bed over its surface? Can he explain how the sheet of lava could be laid over the vegetable matter without burning it, seeing that coals have been metamorphosed by sills of lava that did not come within many feet of the seam and have been coked in volcanic intrusions and were saved from burning apparently only by the absence of the air necessary to sustain combustion? Does Professor Scammell not know that coal is found in regions where volcanic action is absent in the coal measures themselves and in those above them?

That bind contains lime, iron, magnesium, potash and other elements required by plant life is doubtless true, but this may be asserted of more than bind and lava. It is true also of coal. Moreover, sometimes we find coal with a sandstone roof and no bind, and it does not seem to be one whit less coal despite the absence of the bed of lava or bind which Professor Scammell says is essential to the formation of that mineral. Large beds of indurated argillaceous shale or clay—thus is "bind" defined—are found in every coal field, but despite the fact that it has constituents similar to those of lava it proves singularly sterile.

Apparently, from the newspaper story, Professor Scammell thinks that what the bind needs is to be made radioactive with radio-phosphate of potash, whatever that may or might be. Maybe that is so. That chemical might be expected, if it existed, to negative the acidity of the shale. Radioactive material and phosphates of potash are expensive, but the latter doubtless would help greatly to give fertility to any kind of soil. However, while we plead guilty to a lack of agronomy, we confess that whatever faith we might have had in Professor Scammell as a guide has been quite rudely shattered by his speculations on the origin of coal.

Methods of Working Highly Inclined Coal Seams by Room-and-Pillar and by Longwall

Modifications Where Two Seams Are Mined, Where Interval Between Them Is Small and Where It Is Large—Lower Seam Kept 25 Ft. Ahead of Upper Seam—Level Roads Driven from Seam to Seam

BY JAMES S. CHALMERS
Montevallo, Ala.

IN SEAMS that dip heavily—from 45 to 90 deg. from the horizontal—longwall or some modification of it generally is found the preferable system of extraction, whether the seams are moderately thick or very thin. Especially is this true when the depth of the seam is as much as, or exceeds, 700 ft. The pressure at that depth is great, particularly where the seams have steep inclinations. Until they reach that depth, however, they may be worked by room and pillar.

Workings thus dipping may be approached either by shaft or slope. They should be worked in lifts measuring 500 ft. down the pitch and 2,000 ft. on the level. In each panel, near its center, carriage-, balance- and manways are driven to the rise. By means of the carriage- and balance-way the coal is lowered from any intermediate roadway to that at the bottom level of its own panel along which it is conveyed to the shaft or the slope.

GENERAL METHOD OF OPENING UP COAL SEAM

Fig. 1 shows a general outline of a method of procedure detailing the manner in which these roadways should be laid out in relation to the hoisting slope. Roadways *AA* and airways *A'A'* are driven level for a distance of 1,000 or more feet. The size of the pillars *B* and *B'* depends upon the depth from surface, the inclination of the seam, the condition of the roof and floor and the nature of the coal. The carriage-, balance- and manways are laid off and driven to the rise a distance of 500 ft., room roadways being started on 56-ft. centers.

Fig. 2 shows how the workings are driven. Pillars

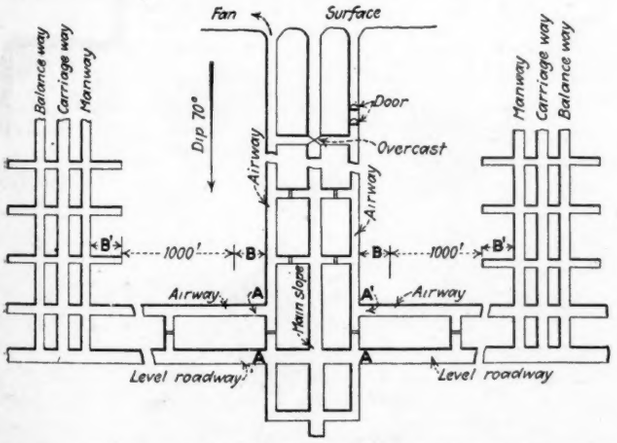


FIG. 1—GENERAL LAYOUT FOR ALL SYSTEMS DESCRIBED
The main slope with two airways goes down the full pitch of the measures. Levels are driven right and left, and from these, three roadways are driven straight up the pitch. One is a roadway in which a carriage, or cage, runs carrying a single car. A second is one in which a balance car is provided to retard by its upward movement the downward movement of the cage and to cause by its downward motion an upward motion of the cage. The third road acts as a manway.

are blocked out 40 ft. square by roadways driven 16 ft. wide so as to allow 6 ft. on the low side for the stowing of bottom rock (see Fig. 3). The pillars are cut through to the rise by crosscuts spaced on 52-ft. centers. These crosscuts are started away 7 ft. wide and are necked to 12 ft. after they have been driven 9 ft. They maintain an even width of 12 ft. until they are within 9 ft. of the roadway above, when they again are narrowed down to 7 ft. (see Fig. 4). Fig. 5 shows the

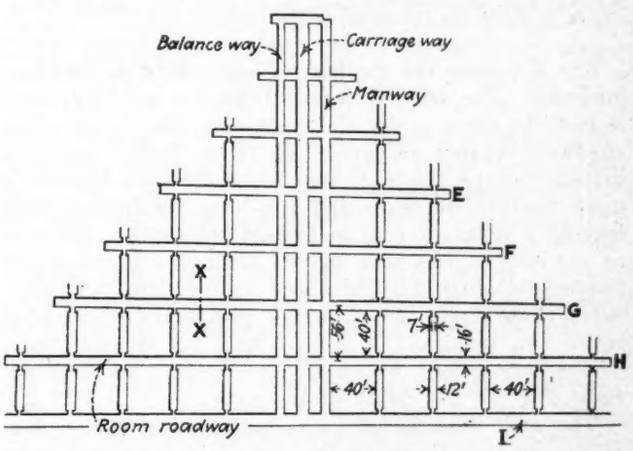


FIG. 2—PANEL LAID OUT FOR ROOM-AND-PILLAR MINING
Rooms and crosscuts are driven so as to cut the panel into pillars 40 ft. square, the rooms being 16 ft. wide and crosscuts 12 ft. wide. The dimensions are to be taken in the plane of the seam, which is 70 deg. from the horizontal.

method of laying track in a room past the point where a crosscut has been driven into it from the room below it.

The blocking out of these pillars continues till the specified length and width for the panel has been reached. It will be noticed that in laying out Fig. 2 the lower room roadways will attain their ultimate length much sooner than at the top of the panel. As soon as the first two roadways, *I* and *H*, reach the end of the panel, the pillars are brought back. Crosscuts *C* and *C'* are driven to the rise through the ribs, which are then drawn, the upper pillar, *D*, being kept 15 ft. in the lead of the lower pillar *D'* (see Fig. 6).

It should be added that a 9-ft. pillar is left above *D* to protect the room roadway *G*, (see Fig. 6). Diligent attention must be given to the timbering in the extraction of these pillars. Props should be set not more than 3 ft. apart and precautions should be taken to see that none at any time is left standing in the gob. When roadways *G* and *F* (see Fig. 2) reach the end of the panel they are brought back in the same way as *I* and *H*. The 9 ft. of coal below the lower roadway, *G*, is taken out, and 9 ft. of coal is left on the lower side of room *E*. This method is continued until all the pillars are extracted.

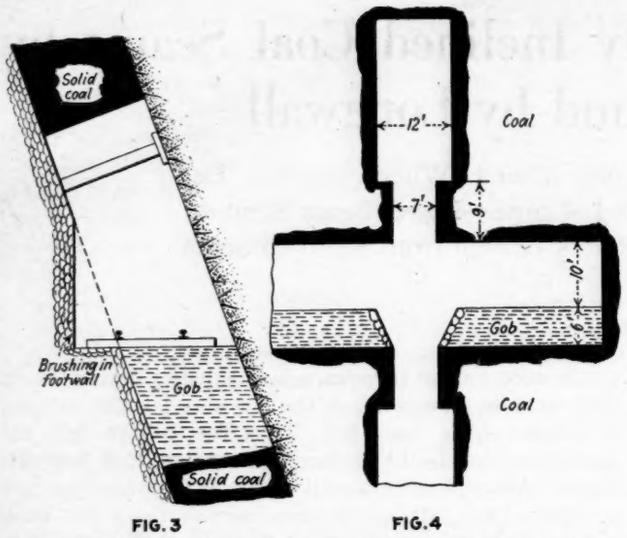


FIG. 3 FIG. 4

FIGS. 3 AND 4—METHOD OF DRIVING ROOMS AND CROSSCUTS

Fig. 3 is a sectional side elevation along the line *XX* in Fig. 2. It shows how a foothold is excavated in the footwall and how the material thus loosened is stowed in the lower part of the room. Fig. 4 is a plan on the plane of the seam.

Fig. 7 shows the method of extracting a seam by longwall. The general layout from the hoisting slope is just the same as for the room-and-pillar work. The roadways branch off every 56 ft. as before and are driven through the solid coal for a distance depending upon the dip of seam and the local conditions, thus leaving a pillar of coal to protect the entry. As soon as roadway *A* has been driven through the coal pillar the neck is widened to the rise so as to connect *A* and *A'*. When these places are connected all the coal *A* and *A'* is taken out, making the first wall of the longwall face. These connections eventually are made between the necks for the full depth of the panel.

The walls must be kept in position as in Fig. 7, wall *B* leading wall *B'* by 15 ft., wall *B'* leading wall *C* by an equal distance and so to the full height of the panel.

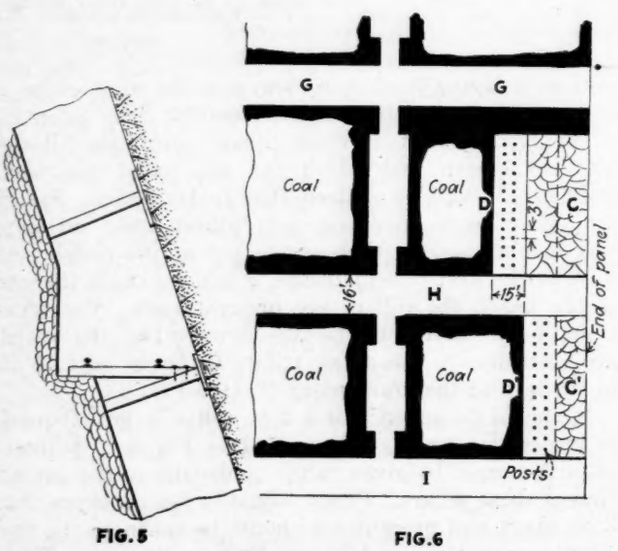


FIG. 5 FIG. 6

FIGS. 5 AND 6—SUPPORTING TRACK OVER CROSSCUT AND DRAWING PILLARS

Where the crosscuts intersect the room roadways, what closely resembles a shaft is formed in the floor of the room and the track has to rest on heavy posts each tightened by a cap. One end of the tie rests on the recess in the footwall and the other end of the tie is beveled and securely spiked to the prop, which, being only 20 deg. from the horizontal, is more like a crossbar than a post. Fig. 5 is an elevation, whereas Fig. 6 is on the plane of the seam. A 9-ft. pillar protects the upper room of the three shown.

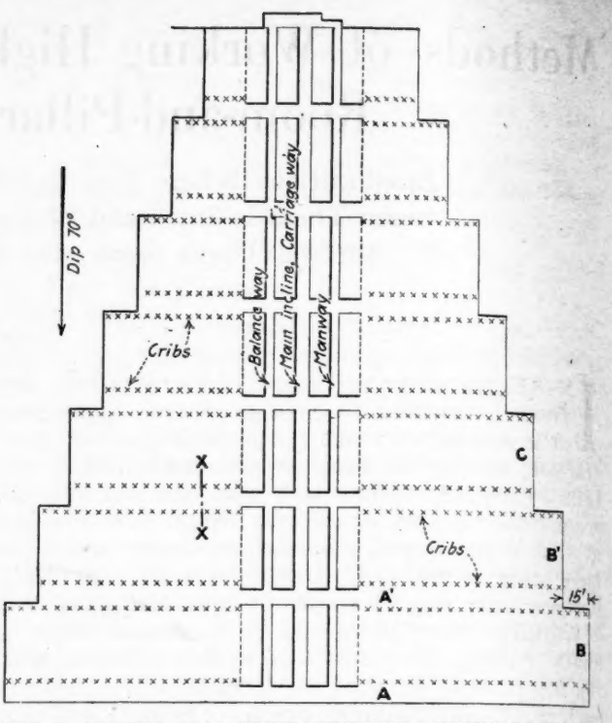
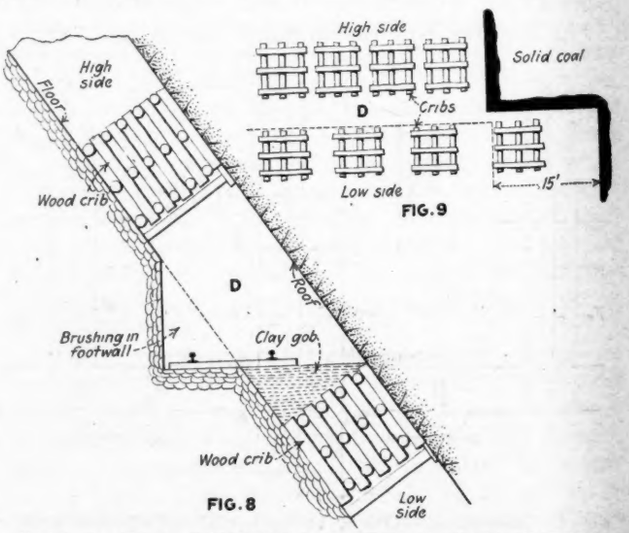


FIG. 7—MINING COAL WITH PITCHING LONGWALL FACE

With precisely the same initial development longwall faces are started which run directly up the pitch, a pillar being left on either side of the inclined roadways. This illustration is on the plane of the seam.

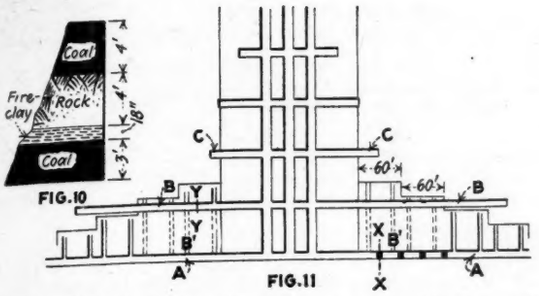
Cribs of soft wood are built on both high and low sides of the roadways, as shown in Figs. 8 and 9. The footwall is brushed, as in Fig. 8, so as to afford material for leveling the track, any surplus rock being thrown into the open space in the "wall" below. The longwall workings must be timbered in a systematic manner, and the timber must be extracted from the gob in a manner equally systematic.

Fig. 10 shows a cross-section with two seams of coal having 5 ft. 6 in. of rock and fireclay between them. It also is represented as lying at an inclination of 70 deg. The triple roadways are driven in the upper seam for the full depth of the panel, and roadways are branched



FIGS. 8 AND 9—LONGWALL GATEWAY IN ELEVATION AND IN PLAN ON PLANE OF SEAM

Fig. 8 shows how the material shot out of the footwall is used as ballast to support the road, which has to pass not so much alongside the wood cribs as resting on the sides of them. Fig. 8 shows elevation *XX* in Fig. 7. Fig. 9, which is a plan on the plane of the seam, shows how the cribs are placed and the face is offsetted.



FIGS. 10 AND 11—SEAM SECTION AND WORKING PLAN

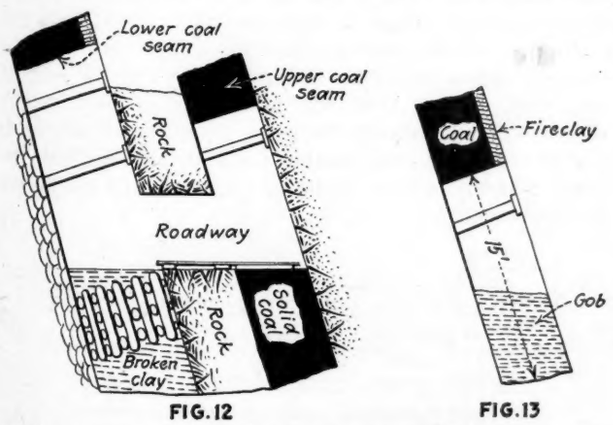
Here the longwall face is level and not pitching. The roads pitch and not the working face. Cross-sections *XX* and *YY* in this illustration are shown in Figs. 12 and 13 respectively. The coal and fireclay together being 4 ft. 6 in. thick, enough to admit a car, no excavation in the footwall is necessary.

off as before at 56-ft. centers. Also, as before, a pillar of coal is left to protect the triple roadways. The level roadway *A* is driven first, but all the others are left standing until they are needed (see Fig. 11).

From roadway *A* in the upper seam, level roadways are driven every 56 ft. through the rock and fireclay to the lower seam. A 15-ft. slab, 60 ft. wide, is taken to the rise in the lower measure (see Fig. 12), the 18 in. of fireclay being thrown back as shown in Fig. 13. This slabbing forms the first wall. The level roadway in the lower seam being extended from level roadways from the upper seam the requisite number of walls required to reach the end of the panel are developed in turn, each wall being stepped back a few feet from the one nearest it.

These walls, as stated, are 60 ft. long and are worked to the full rise, each wall having two chutes down which the miner slides his coal, which is shoveled into cars at the end of the chute. Each chute is lined with wooden boards and cribs built as shown in Fig. 14.

As the longwall faces progress from roadway *A* toward *B*, the roadway in the upper seam is extended, and roadways are driven through to the lower seam every 56 ft. By this means the chutes have to be maintained only for the distance between the two adjacent roadways *A* and *B*. As the walls advance to roadway *C* that roadway is driven, and the same method is followed as in the roadways below. Fig. 11 shows the general outline and position of walls going to the rise in the lower seam, also the roadways in the upper seam. These latter roadways are excavated 15 ft. wide, and cross-



FIGS. 12 AND 13—LEVEL ROADS DRIVEN BETWEEN AND ALONG THE COAL SEAMS

As the seams are nearly vertical it is quite easy to drive a level roadway from the upper to the lower seam through the intervening rock. The roadways along the seam, as shown in Fig. 13, are made 15 ft. wide. The space in the lower side of the room in the lower coal seam is used for the gobbing of the fireclay removed from the roof of that measure. Fig. 12 is a cross-section taken at *XX* in Fig. 11, and Fig. 13 is a cross-section taken at *YY* in the same illustration.

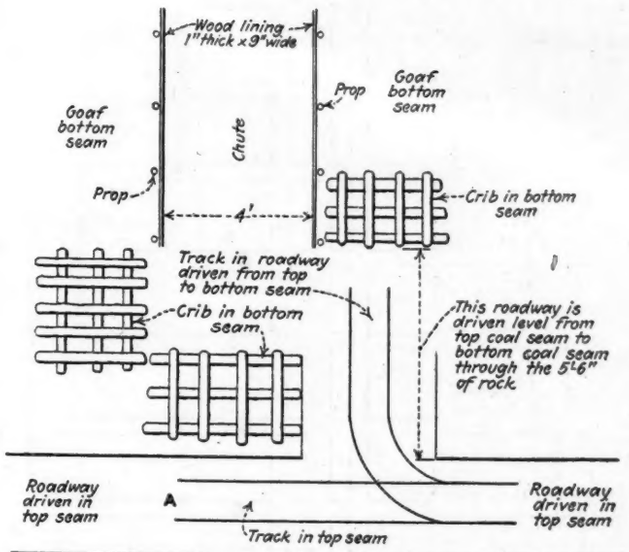


FIG. 14—CHUTE IN LOWER SEAM, ROAD IN UPPER SEAM AND BETWEEN SEAMS

Unfortunately it is not practicable to raise the chute and build a battery in the lower seam, for the quantity of coal to be dropped down the chute before its abandonment is not large. The coal, therefore, falls to a shoveling floor and not directly into the mine wagon and is loaded by a miner into a car standing on the extension of the cross road between seams.

cuts are driven to connect the roadways whenever these are needed for the supplying of air. When these roadways reach the end of the panel, as roadways *A* and *B* will first, this seam is worked back as illustrated in Fig. 6.

Fig. 15 shows two seams separated by 52 ft. 3 in. of rock and lying also at an inclination of 70 deg. Triple entries, similar to those already described, are driven in this case in the lower seam and roadways set off from them at 56-ft. centers, leaving as before the required width of pillar to protect the entries. They then are opened out by longwall, as has been described above. The lower seam only is provided with triple slopes, the upper seam being prepared for opening by passageways through the rock from the lower seam. Even though the upper seam has no triple slopes to be protected, its level roadways are also driven narrow until they reach the end of the pillar left to protect the triple entry as in Fig. 16. Level roadways are driven from the lower to the upper seam, as in Fig. 17, at every alternate roadway—that is, at *A*, *B*, *C* and similar locations (see Fig. 16)—and as soon as the top seam is reached roadways are set away to the right and left.

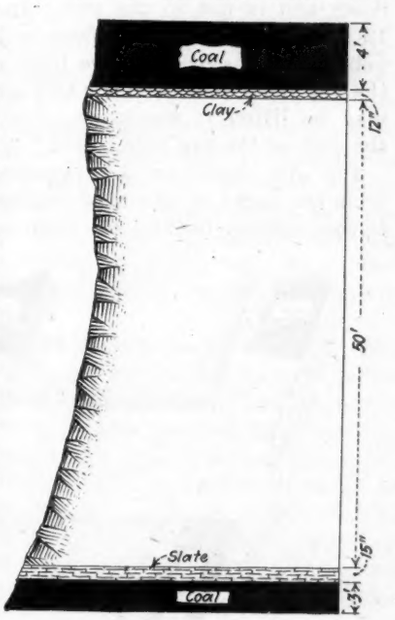


FIG. 15—CROSS-SECTION OF ANOTHER SEAM

Though these two seams are far enough apart that they usually would be mined separately, except that they would be brought to a common main slope or shaft, they are here described as being operated in close conjunction.

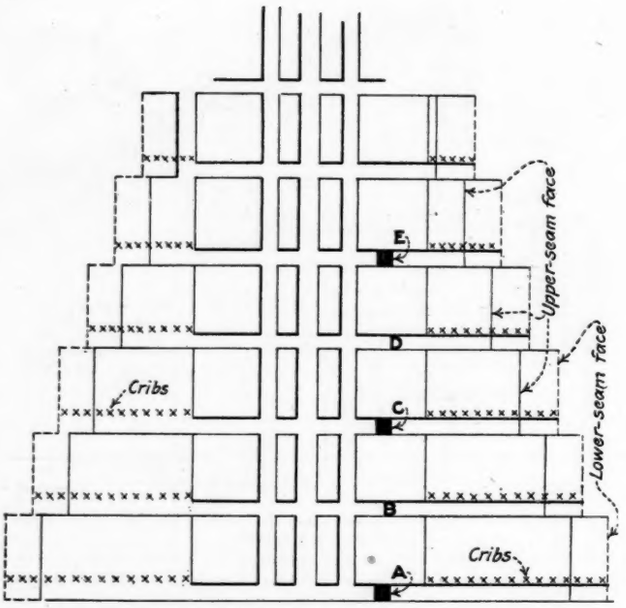


FIG. 16—LONGWALL WORKINGS IN BOTH SEAMS

The workings are kept under one another, as seen in a front elevation, which in this case is only slightly different from a plan in the plane of the coal seam. The excavations in the bottom seam are kept 25 ft. ahead of those in the upper seam.

When the roadway to the left has been driven a distance of 40 ft. an inclined road is started in the coal so as to rise one foot in four (see Fig. 18). This is continued until the slant roadway is 40 ft. from the high side of roadway *A*. Here roadway *B* is started and driven to the point at which the longwall is opened out. The same method of opening out is applied in both seams.

The line of face is stepped both in upper and lower seams, as is shown in Fig. 16. The distance between the faces of the lower and upper seams must not exceed 25 ft., the lower seam being kept in advance. In the bottom bed the 15 in. of slate in the roof is taken down and is put in the gob. In the upper seam the 12 in. of fireclay in the floor is lifted, and it also is gobbed. Lines of cribs are built on both the high and the low sides of both upper and lower seams. The floor may be lifted if necessary; this depends entirely on the size of the car being used.

Fig. 19 shows an arrangement for lowering cars from the upper of alternate roadways in the upper seam to the roadway in the same seam just below it. A roadway to the full rise of the bed is driven from *A* to *B* (see Fig. 16) to a point 20 ft. from *B'*. It is in this roadway that the balance car works. This balance is so arranged that it runs only half as far as the car. The full car on descending hauls up the balance and the balance on descending hauls up the empty car. To prevent the balance car from running back when the full car is disconnected from the rope at the foot of the slope, the rope is held fast as shown in Fig. 20. A short piece of chain is attached to the end of the rope. To this an auxiliary piece of chain is attached, the end of which can be hooked over a bolt when the car reaches the foot of the inclination. This holds the balance car in position until the empty car is attached.

Figs. 21 and 22 show a side view and plan of the arrangement at the mouth of each level road near the carriageway. Rails *AA* are built up level with the deck of the carriage (see Fig. 23). The roadway is continued at the same level as at this point and driven accordingly. Fig. 22 shows the safety and signal arrangement combined in *BB*. Fig. 23 shows a side view of the carriage, which is built specially to suit both the inclination of the seam and the size of the car. Fig. 24 shows a side view of the balance car. This is built of long and narrow cast-iron plates bolted together as shown. Fig. 25 shows the general outline of drums *D* and *D'*, carriage- and balance-ways *W* and *W'*, also the sump *S* at the bottom of the carriageway and the layout of the tracks.

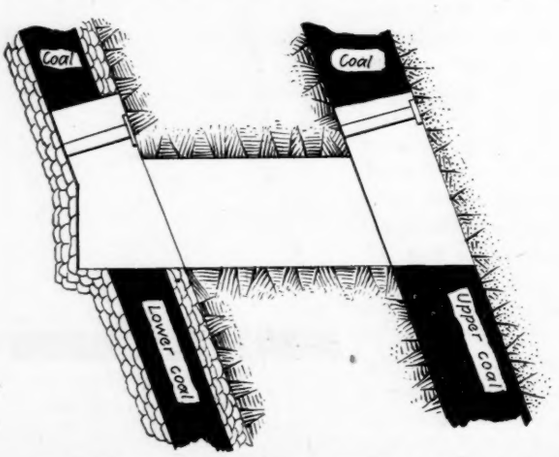


FIG. 17—SHOWING CONNECTION BETWEEN TWO SEAMS

The roadway is not driven as high as those within the seams, where the material to be excavated is coal.

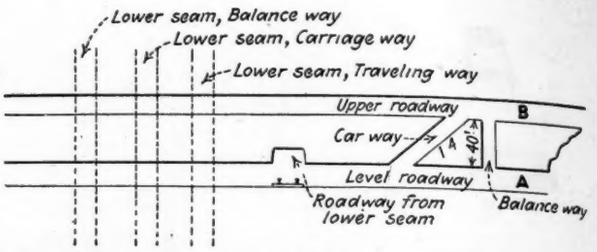


FIG. 18—HOW ADJACENT LEVELS IN UPPER SEAM ARE CONNECTED BY A 25-PER CENT INCLINE

By means of this incline the need for interseam roadways at each level is obviated.

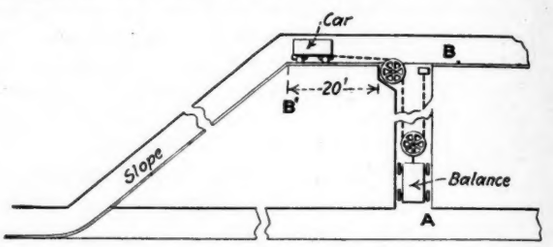


FIG. 19—METHOD OF LOWERING CAR DOWN INCLINE

The balance car travels only half as far as the coal car but on a much steeper pitch.

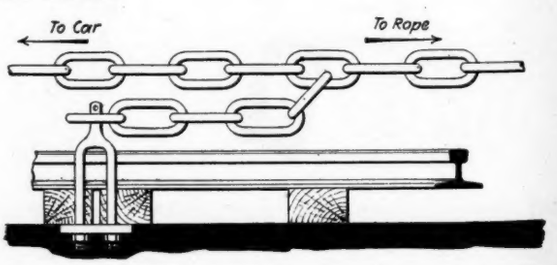
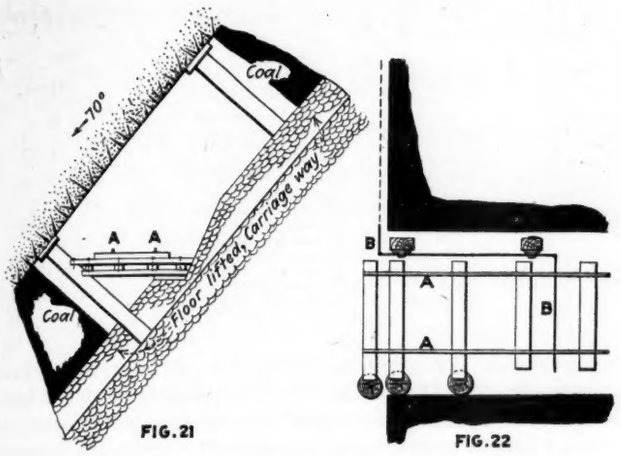


FIG. 20—CHAIN HOLDS ROPE WHEN CAR IS DETACHED

The balance car would immediately descend as soon as the car was detached, but by a hook attached to the track and a short chain, the chain by which the rope is attached to the car is held till an empty car arrives and is hooked on. Then the short chain is released.

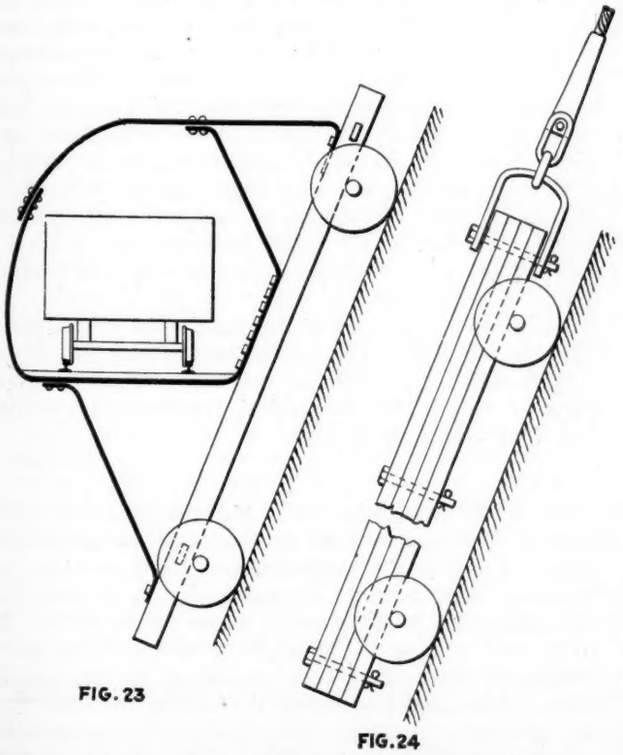


FIGS. 21 AND 22—SIDE VIEW AND PLAN OF LEVEL ROAD AT CARRIAGEWAY

The level road is set at such an elevation that cars can run from it to the deck of the cage as shown in Fig. 23. Fig. 22 shows not only this road but the safety and signal arrangement to prevent cars from running down the carriageway.

In operating this self-acting arrangement the rope to the carriage comes off drum *D'* at the bottom. The rope balance comes off drum *D* at the top. The balance is so loaded that in going down the inclination it will bring up the carriage with the empty car. The man operating the drums applies the brake, stopping the carriage at any landing desired. He keeps the brake tightly applied while the empty car is taken off the carriage and the full car put on. When the signal *BB* is lowered (see Fig. 22), the brake is eased off and the carriage with a full car will bring up the balance. When the carriage lands at foot of the slope into sump *S* (see Fig. 25), the deck of the carriage is level with the track on each side of the sump. The brake again must be kept tightly applied until the full car is taken off and the empty car put on.

It will be noted that both cage and balance car have long wheelbases, so that there is little chance of a derailment even if the roadway laid for these carriages is somewhat out of line.



FIGS. 23 AND 24—CAGE AND BALANCE CAR

The car is lowered so that the surface of the coal is as level when in the cage as when it is hauled along the longwall gateways. The balance car has a body made of heavy cast-iron plates bolted together.

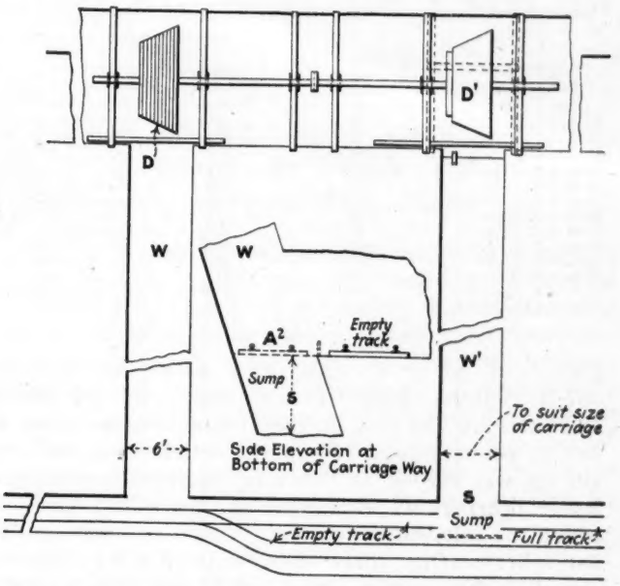


FIG. 25—ELEVATION SHOWING DRUMS AND PARTING

The illustrator has taken some license with the facts, the parting at the bottom being in plan and not in elevation like the rest of the drawing.

Belting to Revolutionize Mining Methods

PERHAPS because belting has been so tardy of introduction in American coal mines is why one has such large anticipations of what it will do when it is properly recognized. If the mines had to create the belting industry; if belts had to submit to the experimentation of men who did not understand the limitations of their own material there might be some fear, but long ago every other industry but coal mining learned the value of the belt. When the power houses were running sharp cinders over belts and the metal-mining industry was loading them with gritty material, the coal industry was wondering if perchance it would chafe a belt overmuch to take a load of soft coal. It seemed not to be realized that coal, being a light, not particularly abrasive material, should have led the way instead of following.

In the very nick of time comes a book on "Belt Conveyors and Belt Elevators," by Frederic V. Hetzel, who for thirteen years was chief engineer of one of the largest companies in the business and who for thirty years has been working on this class of machinery. Mr. Hetzel is practical and straightforward. He tells the story from within, not from without, giving the information of a man who has designed and erected belt conveyors. His book, containing 333 pages measuring 5¾x9 in., is published by John Wiley & Sons, of New York City.

We warn our readers that the book treats coal men with the attention they deserve as belt users but nevertheless it has several interesting references to coal and much that is of value to coal men where it is discussing the subject in general or the matter of the transportation of other material than coal in particular. In the

ACTUAL LIFE OF CERTAIN RUBBER CONVEYOR BELTS

Belt Width, Belt Plies, Belt Cover	Length of Conveyor, Center to Center, Ft.	Speed Feet per Minute	Material Carried	Actual Tonnage	Length of Service	Belt Cost Per Ton of Material Carried, Cents
36 in. x 5, $\frac{1}{16}$ in.	62	275	Screened coke, 30 lb. per cu.ft.	238,237	14 months, worn out	80.11
36 in. x 8, $\frac{1}{4}$ in.	570	493	R. of M. coal, 50 lb. per cu.ft.	2,808,350	5½ years, worn out	.13
36 in. x 6, $\frac{1}{4}$ in.	265	595	R. of M. coal, 50 lb. per cu.ft.	1,134,631	2½ years, worn out	.12
36 in. x 6, $\frac{1}{4}$ in.	265	595	R. of M. coal, 50 lb. per cu.ft.	1,084,640	2 years, worn out	.13
36 in. x 7, $\frac{1}{4}$ in.	510	500	R. of M. coal, 50 lb. per cu.ft.	1,461,520	3 years, worn out	.20
36 in. x 6, $\frac{1}{4}$ in.	75	500	Large coke, 30 lb. per cu.ft.	237,286	3½ years, worn out	.19
36 in. x 5, $\frac{1}{16}$ in.	62	275	Small coke, 30 lb. per cu.ft.	217,644	1 year, worn out	.12
36 in. x 5, $\frac{1}{16}$ in.	25	400	Furnace coke, 30 lb. per cu.ft.	522,205	2½ years, worn out	.03
48 in. x 8, $\frac{1}{16}$ in.	612	400	R. of M. coal	1,339,352	41 months, still running	...
48 in. x 8, $\frac{1}{16}$ in.	361	350	R. of M. coal	2,786,396	38 months, still running	...
48 in. x 8, $\frac{1}{16}$ in.	150	350	R. of M. coal	3,172,915	53 months, still running	...
42 in. x 8, $\frac{1}{16}$ in.	674	350	R. of M. coal	2,651,300	57 months, still running	...
54 in. x 11, $\frac{3}{32}$ in.	740	500	R. of M. coal	2,500,000	70 months, still running	...

matter of power it says of a 48-in. belt between 387-ft. centers, sloped 18 deg., with a lift of 109 ft. and carrying 795 tons of run-of-mine coal per hour at 483 ft. per minute, a 150-hp. motor was used, but only 107 hp. was needed, as shown by electrical instruments. Roller bearings were used for the five-pulley idlers by which the belt was supported. A belt conveyor on similar roller-bearing idlers 48-in. wide on 405-ft. centers, sloped 19 deg., with a lift of 119 ft. and carrying 1,030 tons of run-of-mine coal per hour at 506 ft. per minute was equipped with a 150-hp. motor. Electrical instruments showed that it used 162 hp. A 42-in. belt conveyor with 600-ft. centers, sloped 18 deg., with a lift of 114 ft. and carrying 324 tons of run-of-mine coal per hour at 242 ft. per minute was equipped with a 100-hp. motor, but only 52 hp. was used. This also had roller bearings in five-pulley idlers.

The author says that with roller bearings the conveyor takes less power, the belt is subject to less tensile stress and requires less attention and lubricant, the idlers are less likely to stick tight and thus drag and injure the belt, and that the additional cost of the idlers is offset by a substantial reduction in the size of the motor needed and by a similar reduction in the number of plies in the belt.

Replacing Mine Haulage by Rubber Belt

An interesting quotation should now be made as to the possibilities of replacing mine cars by belting. "With a level belt conveyor one ton per hour can be conveyed a distance of 5,000 ft. over plain grease-lubricated idlers by one horsepower, or roughly 1 hp.-hour will convey one ton one mile. On the basis of power consumption alone a belt conveyor that carries one ton one mile in one hour is not so economical as a horse and cart, and for handling large quantities of material over long distances a train of cars drawn by a steam or electric locomotive will require much less power than a belt or a series of belts. To buy belts with their carrying idlers and driving machinery and build a structure to support the conveyor generally will cost more than to lay track and provide cars and motive power suited to the quantity of material to be handled.

"There are, however, conditions in which a long belt system may cost so much less for operating labor and attendance than will a car system that it will pay to install belt conveyors. For example, an important mining company had under consideration for several years a plan to carry 8,500 tons of coal per day from three inland mines to a shipping point on a river over four miles away. The choice lay between mine-car haulage with electric locomotives on the one hand and a belt-conveyor system on the other.

"From costs derived by the company from the operation of many haulage plants and several large belt conveyors, comparative estimates were made which showed: (1) The total cost of installation of the belt-conveyor system was about 25 per cent below that of the haulage system, and the annual charge for interest was correspondingly less. (2) The annual charge for depreciation for the conveyor system was about 15 per cent higher; this was based on an estimated life of three years for belts, five years for idlers, fifteen years (average) for other machinery and thirty years for steel and concrete work. (3) The estimated power cost for the belts was double that for the haulage. (4) The probable cost of labor and attendance for the belt system was about half the corresponding charge for the car system. This one item showed a difference of about $85,000 between the annual operating costs, and when balanced with the other items mentioned it was sufficient to show an estimated saving of over 3c. per ton of coal carried.

1 Hp.-Hr. to Transport 2½ Tons One Mile

"As a result of this comparison it was decided to install the belt system, and the work is now under construction (1922). The distance from the loading station in the mine to the bin at the river is 23,500 ft., and the total rise is about 200 ft. The conveyors, twenty in number, will be entirely underground and will be installed in existing mine passages which have been widened and straightened for the purpose. The idlers will be fitted with either roller or ball bearings. From power readings of similar conveyors installed at other mines it is expected that 1 hp.-hr. will convey 2½ tons one mile. This is more than twice the quantity which, according to the usual formulas, can be carried over ordinary idlers with grease as the lubricant of the bores of the pulleys."

The table at the head of the page is one of the many valuable tabulations this useful book contains.

It would serve little to list the subjects covered. Suffice it to say that the subject is exhaustively treated and the material up to date.

An Agreement Has Been Made between the U. S. Bureau of Mines and the Refractories Manufacturers' Association for the utilization of the laboratory car "Holmes" and crew for an investigation of fuel-burning equipment at refractories plants in the central district, with a view to determining wherein changes in equipment or practice will result in decreasing fuel consumption and increasing the output of fired ware. As planned at present, the crew will investigate the burning conditions at seven plants, including those manufacturing chrome, silica, magnesite, and fireclay wares. The burning conditions on round, square and rectangular-down draft kilns will be investigated.

Should High Pressure and Small Volumes Be Used in Underground Fire Fighting and How?

Pressure Can Be Regulated by Tanks with Floats, by Reducing Valves and by Throttles Placed in Hose Valves—½-In. Nozzle with 1½-In. 750-Lb. Test Rubber Hose Recommended—Peril in Mixing Impure with Pure Water

IN MANY coal mines fire fighting by direct methods is a subject of keen interest—in the anthracite region because large quantities of timber make the mines peculiarly subject to rapid and expensive conflagrations; in the Middle West and still more in the Rocky Mountains because of the extreme dryness of the timber and its tendency to dry rot.

Perhaps the problem must be attacked in coal mines in a different way from that in use in metal mines, where there is frequently more timber, but the remarks of B. F. Tillson, of the New Jersey Zinc Co., Franklin, N. J., entitled "Notes on the Installation of Fire-Fighting Equipment in Mines," at the recent meeting of the American Institute of Mining and Metallurgical Engineers will be found of interest.

It is noteworthy that they found their occasion in part at least in a bulletin of the U. S. Bureau of Mines published soon after, and as a result of experiments in connection with the Cherry Mine fire in Illinois. The Bureau at that time favored low pressure, and Mr. Tillson presented this paper in the hope that the bureau might make experiments of its own and subject that conclusion to further inquiry. Mr. Tillson remarks:

Not Only Extinguish Fire But Reduce Heat

"Although portable fire extinguishers are valuable for fires that are in an incipient stage, some medium that will dissipate a large quantity of heat is needed to fight a fire in mine timbers, because of the size to which it probably will have grown before discovery. Any method of sealing off or otherwise smothering such a fire with gases that will not support combustion, is often ineffective, for the residual heat will cause reignition when the area is opened, so that fresh air reaches the hot charred sticks of timber. It is therefore obvious that the most effective ways are to drown and cool the hot zone with water and to 'load out' the partly burned material and remove it from the mine.

"Either of these methods requires a direct attack of water upon the inflamed material; therefore every mine containing a large quantity of timber or other combustible should be as completely equipped with a fire-hydrant system as it is with compressed-air mains. Mine managers may at times object to the expenditure, especially if they have not suffered from mine fires and cannot realize the enormous loss of life and property resulting therefrom. The cost of such preventive measures against fires is small in proportion to the losses that may be incurred if a fire gains headway. Furthermore, the system of water pipes installed for fire protection can be used for other purposes, which will pay its carrying charges."

Mr. Tillson's reference to the other purposes for, or uses of, water pipes for fire service, as he himself explains in his article, has in view the need for water for use in wet drilling, but in coal mines the use would be rather the sprinkling of the mine to keep the dust moist. In regard to hand extinguishers he says:

"The old soda-acid extinguisher, or the more modern 'foam' types, are preferable. The former probably does not rely for its efficacy on the carbon dioxide generated but on the smothering and cooling effect of the water and the trajectory of stream that may be obtained because of the gas pressure developed. A foam having a tough film which will smother a fire, even on overhead surfaces, and which will have the added advantage of holding a greater quantity of cooling water against the burning surfaces would seem to be the best medium for fighting incipient fires in mine timbers.

"Fire patrols should examine a mine between the regular working shifts; one round should be made immediately after the last working shift and a second one within four hours. Time clocks should be provided to assure proper watchfulness. It is possible to get time clocks for servicing 100 or more stations. Ours are for sixty-four stations, which is as large a territory as one man can inspect. In a large mine the fire-patrol routes should also have several mine telephone stations.

"It is customary to have telephones at shaft landings, but these lose their value when access to the shaft is cut off. The interior telephones also save time in the patrolman's report of a mine fire and in the promptness with which help may be given him. It also will enable him to keep in touch with the hoisting engineer or some other centralized party, who would know, by the fire patrol's failure to report, that some accident had befallen him in making his rounds and thus could direct the other patrols or outside parties to render assistance.

"Some mines have avoided the expense of carrying

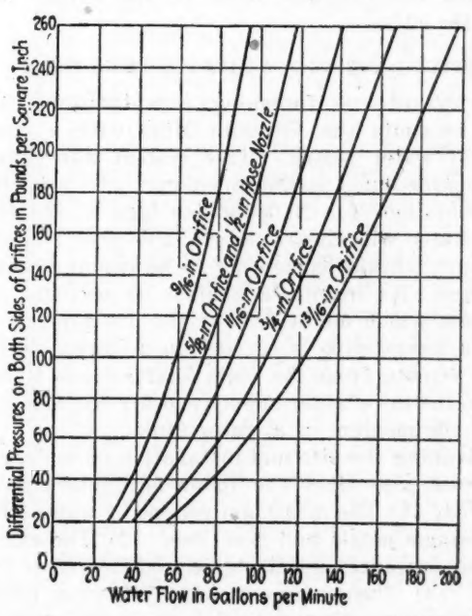


FIG. 1—DISCHARGE THROUGH ORIFICE AT VARIOUS PRESSURE DROPS

Loss of pressure for given flow of water in gallons per minute when a 1½-in. valve has its orifice reduced as noted on the various curves.

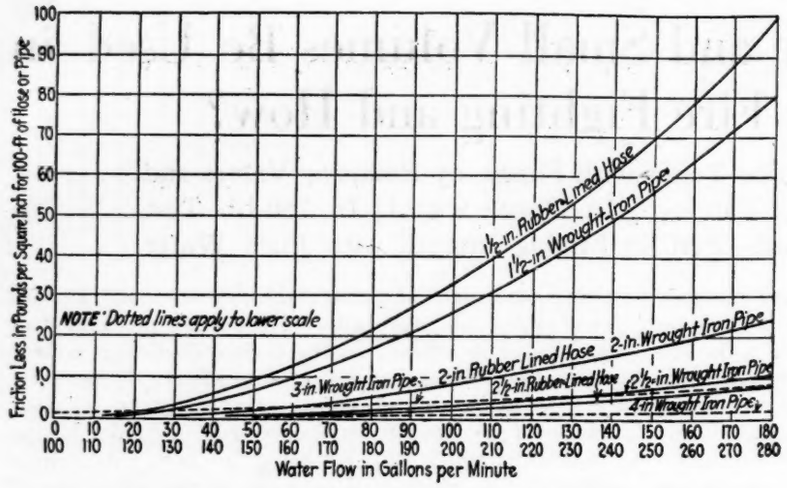


FIG. 2—FRICTION LOSS IN THE DISCHARGE OF WATER THROUGH RUBBER HOSE AND PIPE

The size of the pipe which is recommended for a rubber hose by the author of this paper is 1½-in., the distribution lines being of 3 or 4 in. diameter.

special fire-hydrant mains throughout the underground workings by arranging to turn water into the compressed-air lines in case of fire. There are several drawbacks to this plan. The compressed-air mains usually are smaller than is desirable for fire mains. The air-pipe joints and fittings possibly will be too weak to stand the hydraulic pressures that may be desirable."

Mr. Tillson discusses the use of compressed-air lines for an air supply in fire-fighting, a practice which coal men have never adopted and which most of them would look on with great disfavor. He regards this as a reason for not using compressed-air lines as a possible means of introducing water to a mine fire and then goes on to explain the shortcomings of the device of installing tanks at each level, for service in that level, with connections to the compressed-air lines which would make it possible to give the water a pressure it would not have hydraulically. He calls attention to the way in which such tanks might be depleted of their water and how meager would be the supply in any event. He adds:

Special Piping for Fire Fighting Only

"In view of the foregoing considerations it was decided to equip the Franklin Mine with a complete system of water piping. This system was connected with the mine-pump discharge column, which discharges into the bottom of a 25,000-gallon tank at the surface so that water will always be available even though the mine pumps should happen not to be running when the fire occurs. As insurance against an accident in the main shaft which might destroy the fire-fighting water supply, a second pipe is carried up a supply shaft and manway remote from the main shaft, where it can be joined to the town water supply and fire-hydrant system through the medium of a water tank.

"In planning the size and installation of underground fire-hydrant pipe lines the following factors must be considered: (1) The maximum volume of water effective from a single nozzle and hose line. (2) The minimum headroom clearances and the trajectory desired of the fire streams. (3) The maximum water pressures available. (4)) The number of streams it is desirable to play upon a fire at one level. (5) The greatest length of hose that should be relied on to carry the water from the pipe line to the fire. (6) The extent to which the hose will have to be transported, especially up confined ladderways. (7) The outcome of a decision as to whether advantage will be taken of the light weight and accessibility of the hose to rely upon the fire patrolman to make a prompt attack upon the fire while awaiting more extensive help.

"The New Jersey Zinc Co. has come to the conclusion that underground fire-fighting measures are widely different from those of fires in surface buildings. The exposed areas of the inflammable materials in a mine are not so large, the material is more concentrated, its height is not so great, nor is it exposed to the action of winds. On the other hand, the hot gases are likely to come into the faces of the fire fighters and the confinement of the workings will require the nozzle men to approach closer to the blaze than is customary at surface fires. Surface fire-fighting technique and equipment should not therefore be closely followed.

"A standard surface fire stream is based on a discharge of 250 gallons of water per minute, which will be passed by a 1½-in. nozzle when the water at that point has a pressure of about 45 lb. per square inch. The smallest pump approved by the National Board of Fire Underwriters must discharge 500 gallons per minute or serve two such streams. It seems unnecessary to handle such volumes of water for the direct attack of mine fires and, in fact, it would appear undesirable to have such quantities draining through filled ground, undermining the timbers which the ground supports and unnecessarily taxing the mine drainage system.

Higher Pressures Give Flat Trajectories

"At the same time it seems desirable to have flatter and longer horizontal trajectories than are obtainable from the comparatively low pressures used with surface fire streams; flatter trajectories are easily obtained with the high static pressures obtainable from mine-pump columns, because of the depth of the mine workings below the surface. To reduce the volumes of water discharged the New Jersey Zinc Co. uses much smaller nozzles than those used in surface fire fighting for any given range of pressure, for if the nozzle is not made of sufficiently small cross-section, the water is ejected too much in the form of a spray instead of a fairly solid stream and will not carry well through the air.

"Some tests were made along these lines about ten years ago under the direction of George S. Rice, of the U. S. Bureau of Mines, and the results were published in Technical Paper No. 24, "Mine Fires," of which he is the author. However, these tests were not carried out under pressure anywhere near as high as we considered desirable and at which we have carried out a few experiments.

"Probably the chief reason why other tests were not made by the U. S. Bureau of Mines, which was cooperating with the Illinois Mining Commission and the National Fire Underwriters' Association, is its conclusion 'that one man cannot readily handle a 1½-in. hose with a ½- to ¾-in. cone nozzle in a narrow place, such as a mine entry or heading, when the water pressure exceeds 40 lb. per square inch and only with difficulty when the pressure is 50 lb. or over.'

"I take exception to this statement, which was repeated last fall in the report of the Standards Committee of Mine Fire-Fighting Equipment of the American Mining Congress. Our experience under the operating conditions below ground is that with either a ½- or a ¾-in. nozzle and with a 2½-in. hose one man has no difficulty in controlling the nozzle reaction under pressures ranging from 150 to 186 lb. per square inch (the latter being the highest available under the conditions of our tests).

"I cannot but wonder whether the above adverse opinions were due to tests made in the handling of, say, 1⅛-in. nozzles where the considerably greater volumes of water discharged naturally greatly augment the nozzle reactions. I would, therefore, strongly urge a renewed study of this subject by the U. S. Bureau of Mines and feel confident that its data and opinions will then be revised.

"We have adopted as a normal condition a ½-in. smooth-bore conical nozzle 12 in. long which will pass about 90 gallons of water per minute under what we consider to be a proper working pressure of 150 lb. per square inch. We have further adopted a 1½-in. rubber-lined rubber-covered fire hose with the intent that the maximum length of hose to serve a nozzle will be 200 ft., as it will then pass 90 gallons per minute with a pressure loss from friction of about 56 lb. per square inch.

"Under these operating conditions it would be possible to use a 'Siamese' connection on the end of 150 ft. of 1½-in. hose and connect two nozzles each with a 50-ft. length of hose and have a pressure of 90 lb. per square inch at each nozzle and pass 70 gallons per minute from each nozzle, or a total of 140 gallons per minute from the one hydrant connection if the pressure at the hydrant was 200 lb. per square inch.

Rosette Spray to Blanket Back Hot Gases

"It would seem that one of these nozzles might well be employed to form a rosette spray to blanket back the hot gases and form a fire-insulating shield which would permit the second nozzle crew to approach the flames more closely. If the headroom in the drift were 6 ft. in the clear, each of the above streams might be expected to strike a point in the roof about 55 ft. from the nozzle or to wet a point on the floor 100 to 110 ft. away.

"One of the factors to be decided is the method to be employed for regulating the hydrant pressures on the different levels and the maximum static pressures which will be permitted on the water lines. A reduction in these static presures may be obtained: (1) By breaking bulk through the installation of water tanks on different levels; (2) by the installation of pressure-reducing valves for the water supply at each level; (3) by the installation on each level of individually proportioned throttling orifices for the fire-hydrant outlets. The last method was chosen as the cheapest to install and to maintain.

"The first method requires one or more water tanks to serve each level (depending on its length); these must be located several levels above the one to be served, in order to give sufficient water head, and each tank must be of sufficient depth to afford a velocity head sufficient to assure the free passage of water from the tank to the pipe to supply the maximum water demand. Each tank must be equipped with float valves which will control its water supply. Unfortunately these valves are not easily kept in good operating condition. Furthermore, instead of a single pipe or two, the second being provided for safety, there is one or two for each level, and as the levels are close those for different levels overlap.

'The second method is that of using pressure-reducing valves. This requires a large investment for these rather expensive appliances. Moreover, they are not satisfactory for controlling static pressures and are likely to get out of order, especially when used with the dirty water from the mine. Their maintenance in working condition is sure to be expensive.

"As engineering literature appears to have no data covering the design of such pressure-reducing orifices, I have plotted, for the convenience of those who may wish to use such a pressure control, a number of curves showing the discharge ratings for a number of orifices of different sizes adapted to such an installation (see Fig. 1). The discharge of a ½-in. hose nozzle is practically the same as that of a ⅝-in. plate orifice. A chart also is given showing the pressure losses from the friction of various quantities of water flowing through 1½-, 2-, and 2½-in. rubber-lined hose and through wrought-iron pipes ranging from 1½ to 4 in. in diameter (see Fig. 2).

"Another chart shows the total pressure needed at the hydrant outlet for a ½-in. nozzle combined with 100 ft. and 200 ft., respectively, of 1½-in. rubber-lined hose,

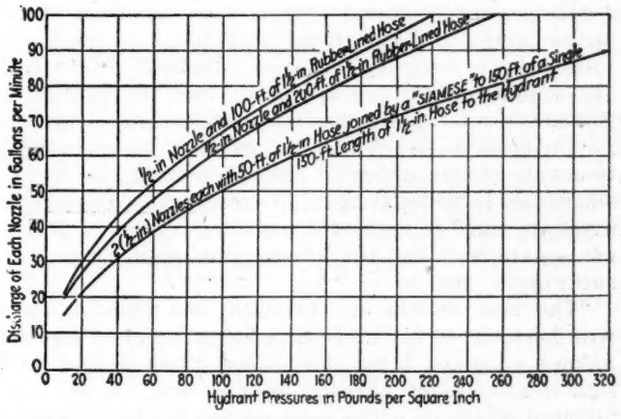


FIG. 3—TOTAL PRESSURE REQUIRED AT OUTLET SIDE OF HYDRANT ORIFICE

This allows for hose and nozzle friction and for a discharge of the stream indicated on the vertical co-ordinate on the left.

and also the pressure needed when two ½-in. nozzles (each with 50 ft. of 1½-in. hose) are 'Siamese-connected' to a single 1½-in. hose line 150 ft. long attached to one hydrant outlet (see Fig. 3).

"The fourth chart shows the approximate maximum distances that may be reached by fire streams from ½-in. nozzles operating at various pressures when the nozzle is elevated about 12-in. above the floor of a drift which is only 6 ft. high in the clear (see Fig. 4).

As the maximum static water pressure in the mine was about 500 lb. per square inch and as 3- and 4-in. lap-welded wrought-steel standard-weight pipes are rated to stand 1,000 lb. pressure per square inch and under tests have shown bursting pressures of 5,000 to 6,000 lb. per square inch, it seemed advisable to carry full pressures on the water lines and take advantage of the large drops in pressure then available to overcome friction losses and to install smaller pipes than otherwise would be required. It seemed that excellent results would thus be obtained in spite of the fact over 3,000 ft. of pipe was required on a level. It was not necessary, therefore, to use 4-in. pipe on levels more than 420 ft.

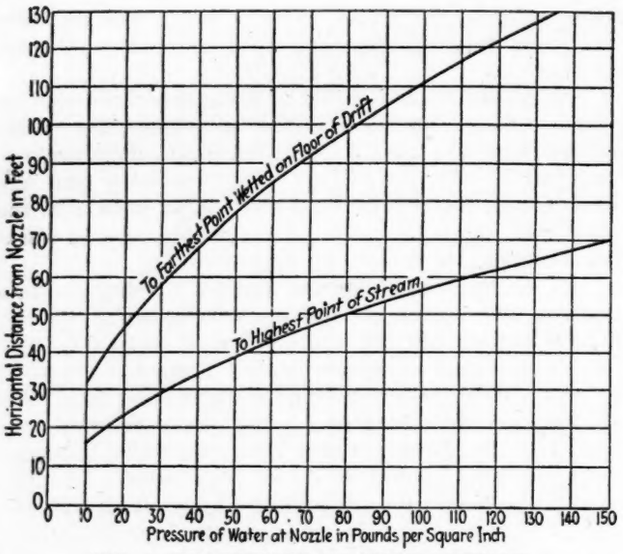


FIG. 4—TRAJECTORY OF HOSE STREAMS

This is the distance the stream will travel and the point at which it will reach its greatest height when escaping from ¾-in. nozzle elevated 12 in. above the ground with a maximum height of stream limited to 6 ft. above the floor of the drift.

below the surface, and some of the pipes used even on these levels are of 3-in. diameter.

"In general, screwed joints were provided, some flange joints, however, being introduced to make the installation of various bends easy. Malleable-iron standard refining-oil fittings are used from the surface to the 400-ft. level and extra-heavy malleable-iron fittings for the lower levels. These fittings were chosen in order to assure ample strength against mechanical strains which may be added to the water pressures. The lighter pipes are rated to withstand a water pressure of 200 lb. per square inch and the heavier are adapted for pressures up to 1,000 lb.

"The hose outlets are 4x4x2-in. and 3x3x2-in. tees with bushings to 1½-in. to which are attached by screwed nipples standard brass 1½-in. hose gate valves with male hose-coupling threads on one end. Brass caps attached by chains to the valve protect the hose-coupling threads when not in use. These valves are rated at 125-lb. steam pressure and 200-lb. water pressure, but our tests showed that they would stand 800 lb. per square inch hydraulic pressure without deformation or leakage. The hose coupling end was internally threaded with twenty-four threads per inch (as shown in Fig. 5) to permit the screwing in of the orifice plug which is used to control the outlet hydrant pressures. This threading also proved tight under a pressure of 800 lb. per square inch.

"These orifice plugs were installed as described on the outlet side of the hose valves so as to facilitate their removal should it be necessary to clean out any pieces of bark or wood fiber that might lodge behind and constrict them. This can be done easily and quickly after the hose gate valve is closed. As only open nozzles are permitted on the hose lines, the maximum pressures on the fire hoses will be the dynamic pressures permitted by the orifice dimensions. As there is a remote possibility, however, that a kinking of the hose might place it under a higher static pressure of possibly 500 lb. per square inch, the fire hose must stand 750 lb. per square inch bursting pressure for 5 minutes and some of the hose is built to stand a bursting pressure of 1,000 lb.

"We have been working for over six months with a number of hose companies testing special constructions of 1½-in. rubber-lined rubber-covered wrapped duck fire hose of different plies to get great strength and durability, maximum flexibility and portability with minimum weight, and have finally obtained hose that will meet the specifications that will be given later.

"This hose will be supported in 50-ft. lengths stretched out in V-boxes or launders suspended from the backs of the drifts at a slight gradient to insure natural drainage. Water will be passed through it once every six months to wash out the sulphur 'bloom' and stretch the rubber so as to keep it 'lively.' We are led to expect, under these conditions and in view of the darkness and humidity of the mine, that the hose will have a life of about fifteen years, without a depreciation in strength that will reduce the bursting pressure below 500 lb. per square inch.

"In general the hose valves are spaced from 150 to 250 ft. apart, except where the width of the mineral body makes it advisable to place them 50 to 60 ft. apart. The intent is to make the most remote points, even in top slices 50 ft. above a level, easily accessible with 200 ft. of hose. The levels on which the water lines and hydrants are located are about 50 ft. apart in elevation, so approximately 27,000 ft. of 3-in. pipe and 4,000 ft. of 4-in. pipe and about 160 hose valve outlets are required for this fire-protection system.

"Over 40,000 ft. of mine workings on the levels are thus given fire protection, to say nothing of the length of lateral drifts and parallel workings that likewise are protected. Cast-iron nozzles were adopted rather than brass because of their lower cost and because they would offer no temptation to anyone to steal and sell them to junk dealers. Thirty-five such nozzles and about 3,200 ft. of 1½-in. hose seem sufficient to supply complete fire protection.

Fire Lines Interconnected Between Levels

"In general, the fire lines on the levels have three or four vertically connecting pipe lines in ladderways, so that for any fire location the water is supplied in circuit from both sides of the fire area, thus normally reducing the friction losses by splitting the flow in any single pipe line on a level and also insuring a supply, even though a fall of ground should damage a fire line at some point on the level. Of course, enough gate valves are inserted in these mains to permit their necessary segregation under such emergency conditions.

"From 100 to 300 ft. of hose in 50-ft. lengths is allotted to a level, depending on its lengths, and by transportation up or down 50 ft. of ladderways the total quantity of hose on three levels—that is from 300 to 800 ft. hose—can readily be made available on any one level, as ten levels each have 100 ft. of hose, five levels 200 ft. each, and four levels 300 ft. each.

"The new (1922) National Fire Protection Association standard threads for 1½-in. hose couplings have been adopted and are recommended for general adoption by the mining profession, as they also have been adopted by the National Fire Protection Association, the National Board of Fire Underwriters and the Associated Factory Mutual Fire Insurance Companies.

"These male-coupling threads have the following specifications; nine threads per inch with a root diameter of 1.8376 in., a pitch diameter of 1.9138 in., and an outside diameter of 1.9900 in. The threads in the female coupling have a root diameter of 2.0150 in., a

pitch diameter of 1.9388 in., and an internal diameter of 1.8626 in.

"The mine should be equipped with several 'siamese' connections and with transformer couplings to permit under emergency conditions the coupling of the 1½-in. mine hose with the 2½ in. or other sizes of fire hoses used by the town fire departments in the communities adjacent to the mine.

"Although it may be possible to develop a four-ply hose which may approach the performance shown by the actual bursting test described in this paper, the five-ply hose described herewith is unusually strong for its weight and represents the best product we have tested. Its weight, uncoupled, is about 39½ lb. per 50-ft. length, and the pair of expansion-ring type brass couplings will add about 3 lb. more per 50-ft. length. When empty it will bend around about an arc of 8-in. radius without buckling on its inside periphery.

"It was built under a guarantee to stand for five minutes without bursting a test pressure of 800 lb. per square inch. The inside diameter is 1½ in. and the outside diameter 2 1/16 in. The five plies of fabric are cumulatively about 0.155 in. thick in a wall of the hose, so that the rubber lining and rubber cover are each about 1/16 in. thick.

"The rubber in the lining and cover is a high grade compound with good density and so prepared that it will prevent fungus growths from penetrating to the fabric. It should have a small quantity of an antiseptic, such as creosote, incorporated in it in order to insure this mildew-resisting property and should be designed to give a long life—say twenty years—with relatively small depreciation.

Hope Hose Will Last Fifteen Years In Mine

"We expect that a hose that will stand safely 750 lb. per square inch hydrostatic pressure when new will be in condition to stand at least 500 lb. pressure after having been kept in the mine fifteen years, as the exclusion of sunlight, the fairly uniform temperature of about 55 deg. F. and the uniform humidity underground in a mine are excellent conditions for its storage.

"The fabric used in this hose was a high-quality tire duck weighing 17½ oz. per square yard, made of Egyptian quality cotton fiber having a length of 1⅜ in., which is about the maximum obtainable in a staple fabric. The Scott machine used in testing the fabric had a capacity of about 400 lb., so the sample used was a strip 1 in. wide and 3 in. long clamped in the jaws of the machine and the jaws were separated at the rate of 20 in. per minute. When tested this way the duck shows 305 lb. as the strength of the warp and 335 lb. for the filler.

"Sufficient attention does not appear to have been given to the determination of a proper standard method of testing fire hose under pressure for acceptance or rejection. Underwriters' approved hose is commonly marked 'Tested at 300 lb. pressure' and during such tests the hose is under a pressure (varying from zero to 300 lb.) for a total time usually less than twenty seconds. Hose that stands this test may burst if the same pressure is maintained on it for a longer period. The hose manufacturers arbitrarily assume that hoses are suitable for a working pressure of about one-fifth of their instantaneous bursting pressures.

"Even when hoses are tested at certain pressures for five or ten minutes they are under stress too short a time for the test to be of practical value, as longer periods would be involved when in service. I would urge research in regard to the cumulative effect of such strains on the bursting strength of hose and a study of the lasting injury that may be done to the hose by longer testing periods under varying pressures, and would suggest that until such knowledge has been developed, one out of every five lengths of hose be taken at random and submitted to cumulative bursting pressures, each pressure stage being held for five minutes and arrangements for the hose to be under substantial pressures for forty to forty-five minutes in a manner somewhat similar to the performance test on the excellent 1½-in. hose to which reference has already been

BURSTING TESTS ON A FIVE-PLY, WRAPPED DUCK FABRIC, RUBBER LINED AND RUBBER COVERED, 1½ IN. WATER HOSE

Time during which pressure is maintained, min.		Pressure, lb. Per sq.in.	External Diameter, In.
0		0	2 1/16
0		100	2 ⅛
0		200	2 ⅛
0		300	2 5/16
5		400	2 11/32
5		500	2 ⅜
5		600	2 ⅜
5		700	2 13/32
5		750	2 13/32
	Pressure relieved and external diameter measured as		2 3/16
5		800	2 13 32
5½		880	2 7/16
5		970	2 7/16

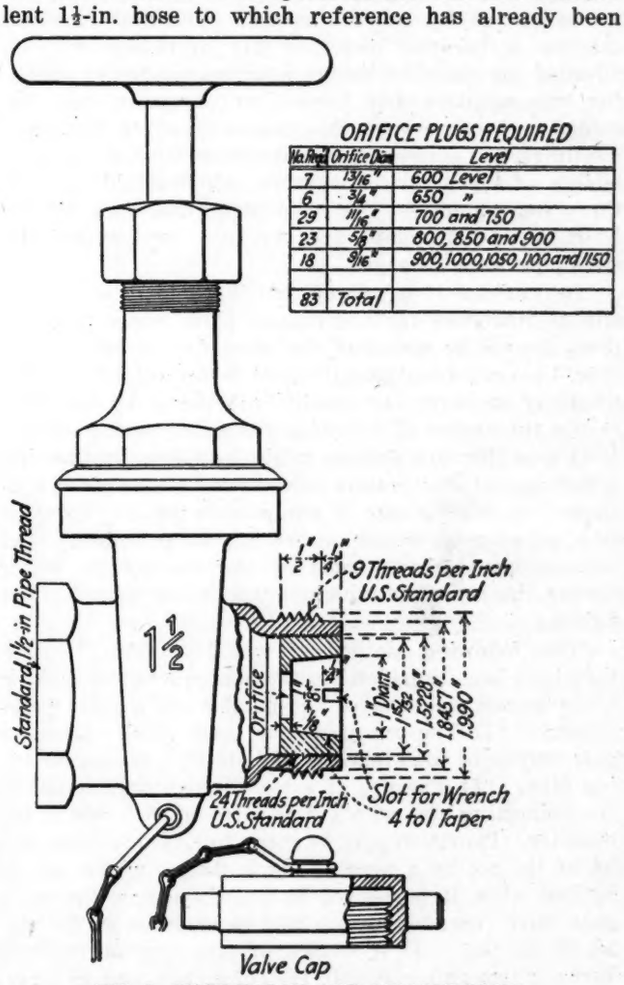


FIG. 5—HOSE VALVE AND ORIFICE PLUG

In order to lower the pressure of the moving stream of water a plug having an orifice which can be varied to suit the line pressure is inserted in the valve. This, of course, does not prevent the full line pressure being imposed on the rubber hose provided it should kink or clog. It prevents the man who is holding the hose from getting the "kick" that goes with fire fighting with hose which is subject to the full-line pressures. It also saves the hose from excessive strain provided it is kept from kinking, assuming, of course, that it does not clog and is not fitted with a spray nozzle.

made. As in this instance, the test can be made on a 3-ft. length, preferably cut from the end of the standard 50-ft. length, and the acceptance of the entire order of hose should be contingent on a perfect showing of all the 3-ft. samples.

"At this pressure the hose was bent in an arc of about 15-in. radius with no noticeable effect on it. The pressure was then raised to 1,025 lb. per square inch and the hose then burst, but not in the portion under tension during the bending test.

"The advisability or inadvisability of connecting, even as an emergency measure, a non-potable water system with a drinking water supply should be given far more serious consideration than has in general been accorded to it. The result of such connections may be an epidemic of typhoid fever or other water-borne disease. Such cross connections, however, are recommended by fire-insurance companies and fire-protection associations.

Helpful in Fire But Destructive to Health

"In general there are two reasons why for fire protection it is desirable to cross-connect the potable system designed for town fire fighting and domestic use with the non-potable system introduced into the industrial plant, whether for its protection against fire, for a supply of cooling water to its condensers, for providing water for its boilers or for other purposes. The first of these reasons is because increased fire protection will be afforded the plant by having a second source of supply for the sprinkler and fire-hydrant systems, and the second is because with this cross-connection the town dwellings and stores will be protected against the possibility of a general conflagration which might occur if the water supply in the town standpipe were to run short or if the mains feeding into, or leaving, the standpipe were damaged.

"In that case it is argued that it would be well to be able to introduce the non-potable plant water into the town system by means of the plant fire pumps. However, I am convinced that it would be far better to suffer whatever property loss might be involved by fire than to run the chance of infecting the public water supply. It is true that precautions might be taken for the disinfection and sterilization of the town water pipes subsequent to the passage of non-potable water. But this later act of grace would not prevent the probability that persons would drink some of the non-potable water during the period in which it was being used for fire fighting.

"The following methods I would condemn, though they have been considered acceptable practice in making cross-connections between non-potable and potable water systems: (1) The use of one or more check valves, or gate valves, or combinations of both in a cross-connecting pipe. (2) The use of a tee with an open outlet in the connecting pipe with a gate valve on each side of the open tee. Provision may be made to close the open outlet of the tee by a plug or blank flange, which can be applied when it is desired to use the connection, or a gate valve (normally open) may be mounted on the outlet of the tee. (3) A section of pipe may be removed between two gate valves in the connection and an emergency section of pipe, fitted with flanges or union couplings, of proper length to span this gap, may be kept available and ready for installation when an emergency demands the completion of such a connection.

"All these methods make possible the pollution of the potable supply when a connection is made, and therefore should be condemned. It is true that the conditions of the relative water pressures between the two sources of water supply may indicate that the only direction of flow may be from the potable to the non-potable system, but no confidence should be placed in such a state of affairs. Some years after this connection has been made, changes in the nature or operation of the plant pumping equipment may reverse these conditions and it is unlikely that the effect of such changes in regard to water pollution will be given any thought.

"Again, it will place an unfair burden upon responsible parties to resist the appeal that plant water be pumped into the town mains at some time when the town water supply is too low to meet a serious conflagration. The immediate urgent need of such a serious situation is likely to outweigh the seemingly more remote possibilities of pollution. If the connection is impossible the temptation for weakness in such a decision will be removed. Therefore, under no circumstances should it be possible to turn a non-potable water supply into a potable water system.

"A potable water supply, however, may be added to a non-potable water system, without danger of polluting the former, by placing a water tank between the two systems. This tank should have the inlet of the potable water supply above the maximum high-water level of the tank. Although this high-water level might seemingly be controlled by the location of overflow orifices or pipes, these might be choked by floating refuse or ice, so it would be safer to have the inlet pipe above the upper rim of the tank; even when so located a float valve may be placed to control the inflow of water. It is obvious that the interposition of a definite minimum air space between the two sources of water will furnish positive assurance against the pollution of the potable water supply from such a cross-connection."

Kingston Coal Co. Opens Community House

The Kingston Coal Co., which produces a sizeable tonnage of anthracite, annually, has opened a community house in Courtdale. The company donated the property some months ago, and the remodelling was completed in time to permit public inspection late in February. While the Kingston company was the prime mover in the community-house project, it has put control into the hands of the public.

The place is designed for the use of Courtdale citizens, and particularly children from the age of six years upward. The controlling organization is the Courtdale Community Club, which is open to everybody twelve years old or over, on the payment of 10c. a month dues, or $1 a year. The executive committee includes a member from every civic, patriotic and religious organization in the town, and every nationality is likewise represented. This committee controls expenditures absolutely.

Provision is made for club rooms for young men and young women. Children from 8 to 12 years have the use of the house Mondays and Thursdays from 5 p.m. to 7 p.m. They also may use it Saturday from 3 p.m. to 5 p.m., for annual membership dues of 25c. A little later there will be free kindergarten classes two days a week for children under eight years. Under the eye of F. E. Zerbey, general manager, the Kingston Coal Co. has maintained a kindergarten in Kingston for some years, and if the Courtdale House maintains the same good grade of work it will be doing a civic service of no small magnitude.

No provision for Sundays is made absolute, but the by-laws give the executive committee power, if they think wise, to open the house Sunday afternoons for reading or congregating, but with no games on that day.

GERMANY HAS GIVEN UP the goose step for the sidestep.—*Washington Post.*

Developments in the Theory of Centrifugal Fans

"Equivalent Orifice" and "Orifice of Passage" Mere Befuddlement of Fan Problems—Analytic Methods of Obtaining Air Columns Generated by Fan—Relative Efficiencies of Single Fans and Fans in Series and in Parallel

BY HENRY BRIGGS*
Edinburgh, England

THE centrifugal fan, with its single moving part, is in one respect the simplest machine in or about the mine, but it has always been difficult to formulate a coherent theory respecting the principles of its action and design. Much that has been written on the subject is open to question, and some of it is definitely incorrect.

Yet a more perfect theory of the centrifugal fan would be of much assistance in practice, for it would help us greatly in understanding the reason for an undue wastage of energy and loss of efficiency or why it is that the machine acts so unexpectedly when the conditions under which it operates are apparently only slightly changed.

The writings of the French engineer Daniel Murgue have profoundly influenced the trend of thought in relation to fan ventilation, but the influence, in my opinion, has been out of all proportion to the real value of his work. Progress can be made only by relegating most of Murgue's notions and conclusions to the scrap heap.

EASIER CONCEPTIONS UNMUDDLE REASONING

The time has come for us to abandon the clumsy convention of the "equivalent orifice" as the means of evaluating the ventilating resistance of a mine and to seek for a simple and direct measure of the resistance of the ventilating circuit, equivalent to the electrical engineer's method of expressing the resistance of an electrical circuit in ohms.

Further, we must reject the "orifice of passage" of a fan, which, as it stands, is useless to the designer; it canot be determined by the process Murgue described because some fans produce a higher depression when passing air than when the inlet is closed. Unless we adopt a straightforward, direct unit by which to express fan resistance and unless we also devise an equally straightforward method of obtaining that resistance, progress in fan design must be retarded.

That many points of similarity exist between the flow of electricity in a conductor and the flow of air in a passageway is no new observation, but it was left to David Penman, principal of the Government School of Mines, Dhanbad, India, and an old student of mine, to make the most complete use of the analogy in one of the most suggestive papers on mine ventilation[1] that has been written in late years.

As Penman observes, the usually accepted relation between the ventilating pressure, p, required to urge the air round the mine and the volume, Q, of air passing per minute is:

$$p = RQ^2 \qquad (1)$$

Moreover, as R includes factors which remain constant so long as the mine resistances are unaltered, R evaluates those resistances. Equation (1), indeed, is the parallel of Ohm's law and differs from the latter only in involving the second power of the current instead of the first. As I elsewhere pointed out, it will be necessary to adopt a name for this unit of resistance before it can come to its full usefulness, and J. Parker has suggested the "atkinson" as that name. If p be measured in pounds per square foot and Q in hundreds of thousands of cubic feet per minute, the resistance of the mine in atkinsons is $p \div Q^2$. Here, then, we obtain a direct measure of mine resistance which is at once simpler in conception and more useful in application than the "equivalent orifice." The latter is an *inverse* measure of resistance connected to R by the relation:

$$\text{Equivalent orifice} = \frac{c}{\sqrt{R}}$$

where c is a coefficient determined by the units used.

In like fashion, we may express the pressure, p_0, needed to overcome the resistance, r, of the fan itself as:

$$p_0 = rQ^2 \qquad (2)$$

Therefore the total pressure, P, required to circulate the volume Q, against the resistance of both mine and fan is

$$P = p + p_0 = (R + r)Q^2 \qquad (3)$$

The most useful relation in connection with a fan is the manometric efficiency; it is the best criterion we possess of the suitability of its design.

The usual definition of this relation, F, is the ratio between the actual pressure (or depression) produced by a fan and the "theoretical" pressure (or depression), and by the latter is meant the pressure that would be produced were the fan perfect.

The hypothetical perfect fan is one of 100 per cent efficiency; it gives out as much energy as it receives, and it has no internal resistance; none of the pressure it creates being wasted in the fan and ajutages, the factor p_0 of equations (2) and (3) is zero; in other words, whereas the actual fan yields a pressure p, the

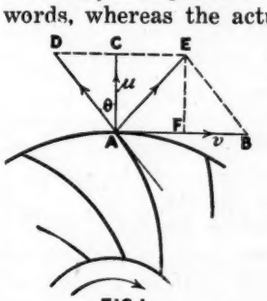


FIG. 1

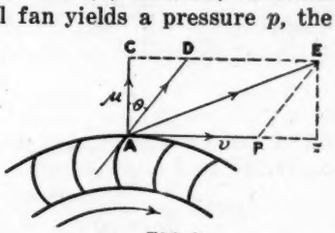


FIG. 2

FIGS. 1 AND 2—VELOCITY DIAGRAMS OF TWO FANS

The left-hand fan has the blades turned back and the right-hand is of the Sirocco type with the blades turned forward. AC is the radial component of the velocity of the air, or u. AD is the velocity of emission of the air relative to the peripheral speed of the tip of the blades. AB is the peripheral velocity of the fan. AC is the resultant of these velocities, which is less than the peripheral velocity when the blades are turned back as in Fig. 1 and greater than that velocity when the blades are turned forward as in Fig. 2.

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[1] "A New Method of Measuring Ventilating Resistances, with Special Reference to the Operation of Mine Fans in Combination," *Transactions Institute Mining Engineers*, LXII (1921-22), p. 39.

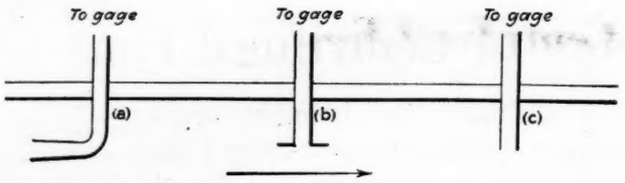


FIG. 3

FIG. 3—THREE WAYS OF SETTING A GAGE

The methods (b) and (c) both give faulty results. A zero or a negative indication may be obtained with a forcing fan and an excessively high reading with a suction fan. The gage should be placed as at (a) and should have limbs 3 or 4 ft. long. The glass should be clean. A little ox-gall in the water helps achieve this, but gasoline or benzine may be used instead of water.

perfect fan of the same dimensions and speed would be able to yield a pressure P when delivering the same volume of air. Thus we see that:

$$\text{Manometric efficiency} = F = \frac{p}{P} \qquad (4)$$

or, from equations (1) and (3)

$$F = \frac{R}{R + r} \qquad (5)$$

Hence the manometric efficiency allows us to determine the relation between the resistances in atkinsons of the mine and fan. For example, if a fan has a manometric efficiency of two-thirds (66.7 per cent), $r = \frac{R}{2}$, or the resistance of the fan is equal to half that of the mine. Again, if F is only 50 per cent, the mine and fan have equal resistances.

As it is obviously desirable that a fan resistance should be small in comparison with that of the mine, a high manometric efficiency is the best assurance we possess of the suitability of a fan to its task. In practice that efficiency, when rightly measured, usually lies between one-half and two-thirds; the fan resistance is therefore generally between 50 per cent and 100 per cent of the resistance of the mine. In such an expression of fan resistance, the losses due to imperfections of the casing and *évasé* chimney are included.

If the total pressure (or depression), termed P, in the above sections be multiplied by Q, the output of air, the product expresses the energy supplied to the fan to use or to squander. If Q is in hundreds of thousands of cubic feet per minute and P in pounds per square foot, that energy will obviously be in hundreds of thousands of foot-pounds per minute. As a matter of fact the quantity pQ is usefully employed in driving air through the workings and the remainder, or p_0Q, is wasted in the fan itself. Now the expression (equation 4) for the manometric efficiency can be rewritten:

$$F = \frac{pQ}{PQ}$$

or, if the numerator and denominator of the ratio be converted into horsepowers:

$$F = \frac{\text{Horsepower in the air}}{\text{Horsepower supplied to the fan}} \qquad (6)$$

The manometric efficiency is thus seen to conform to the accepted idea of an efficiency: It is a ratio of power given out to power put in. By the phrase "horsepower supplied to the fan" is meant the net power actually received by that machine without consideration of any external loss of power; it is the power that would be recorded by, say, a torsion dynamometer on the fan-shaft less the power lost by friction at the fan-bearings.

The "over-all efficiency" or "useful effect," E, of the fan plant is defined as:

$$E = \frac{\text{Horsepower in the air}}{\text{Electrical horsepower of driving motor or indicated horsepower of engine.}}$$

When both E and F have been correctly evaluated it is possible to draw up a useful energy balance-sheet, as in the following example:

A fan has a manometric efficiency of 60 per cent; the motor develops 80 electrical horsepower, the efficiency of the motor is 90 per cent, and the horsepower in the air is 40. The useful effect (from equation 7) is 50 per cent, and the brake horsepower of the motor, 72. From equation (6):

$$\text{Net hp. supplied to fan} = \frac{Hp.\ in\ air}{F} = \frac{40}{0.6} = 66.7$$

$$\text{Power lost in the drive} = 72 - 66.7 = 5.3 \text{ Hp.}$$

FAN PLANT: ENERGY BALANCE SHEET

Receipt	Hp.	*Expenditure*	Hp.
Electrical horsepower of motor..	80	Loss in motor.....	8
		Loss in drive.....	5.3
		Loss in fan.....	26.7
		Horsepower in air.....	40
Total.....	80	Total.....	80

I have tried to emphasize the importance, in the practical sense, of the manometric efficiency; its value has never received proper recognition and has even been denied by some writers. Care must be taken in ascertaining it, and obviously the correct formulas must be used in the simple calculations involved. There is no doubt that these formulas are better understood by those dealing with centrifugal and turbine pumps than by those designing or running fans, and, as many books on mining contain serious blunders in this connection, it is perhaps advisable to look into the matter a little closely.

As most users of centrifugal fans are aware, the shape of the blades has a profound influence on the performance of the machine.

Figs. 1 and 2 show parts of the wheels of two fans, the former having vanes bent back from, and the latter bent forward toward the direction of motion. Both classes of machine are largely used. The angle at which the tips of the blades are bent is represented in each figure as θ, it being measured between a radius to the wheel and a tangent to the blade at its edge, A.

We will adopt the convention of giving θ a positive sign for a forward-trending vane (Fig. 2) and a negative sign for a back-turning vane (Fig. 1). The speed of the periphery of the wheel is in each instance v ft. per second, a velocity which is measured to scale along AB.

Let us consider the action of the perfect fan. It will deliver air in a uniform manner all round its circumference. If q cu.ft. be the air delivery per second, D ft. the diameter of the wheel, and B ft. its width at the periphery, the area of outflow round the wheel (neglecting the thickness of the blades) is πDB sq.ft. and the *radial* component of the velocity of the air on leaving the wheel must be u ft. per second, where

$$u = \frac{q}{\pi DB} \qquad (8)$$

AC (Figs. 1 and 2) represents this radial component in magnitude and direction.

The final velocity of delivery from the wheel must be the resultant of the velocity relative to the blade and of the velocity, v, of the wheel itself. AD represents,

in magnitude and direction, the velocity relative to the vane; that line is drawn as a tangent to the blade at A, and as the radial component is AC or u, its length must be correct. Taking the resultant of AD and AB, we obtain, in each diagram, the length AE as the velocity of emergence.

It will be observed that that velocity is less than the speed of the circumference when the blades bend backward and greater than that speed when they turn forward. In a fan like the Sirocco, in which the vanes point forward at about 45 deg., the speed of the air leaving the wheel exceeds the speed of the periphery of the wheel by about 80 per cent. In this we have the explanation of the high volumetric yield of fans of the type of Fig. 2.

Returning to the diagrams, the blades are responsible in each case for the creation, in the air, of the tangential component, AF, and, from the figures:

$$AF = v + u \tan \theta$$

(The sign becomes a minus for back-turning blades, for θ, under our convention, is then itself negative.)

If w lb. be the weight of a cubic foot of air, qw lb. are delivered per second; hence:

Tangential momentum gained per second

$$= \frac{qw}{g}(v + u \tan \theta);$$

and, as momentum gained (or destroyed) per second is itself the measure of the force creating (or destroying) the momentum, the last expression evaluates the tangential force in pounds, acting at the circumference, which has to be overcome by the source of power. As that force is moved a distance v ft. per second we obtain:

$$\text{Work done per second} = \frac{qw}{g}(v + u \tan \theta)v \text{ ft.-lb.}$$

Now in the fan of 100 per cent manometric efficiency under consideration all this work is used in delivering air against a pressure. A simple way of regarding that pressure is as the weight of a column of air H ft. high, and that is equivalent to a pressure of Hw lb. per square foot. The work done per second is therefore Hwq ft.-lb. Therefore

$$Hwq = \frac{qw}{g}(v^2 + vu \tan \theta)$$

or

$$H = \frac{v^2 + vu \tan \theta}{g} \qquad (9)$$

When the blades are radial at their tips, $\theta = 0$, and this important equation reduces to

$$H = \frac{v^2}{g} \qquad (10)$$

Again, when vanes point forward at 45 deg., $\tan \theta = 1$, and equation (9) becomes

$$H = \frac{v^2 + vu}{g};$$

when they point backward at 45 deg. it becomes

$$H = \frac{v^2 - vu}{g}.$$

Many of the older textbooks give equation (10) but lead the reader to infer that it applies to all kinds of fans. We have just seen that it relates only to fans having radially tipped blades and that the general form, equation (9), must be used in all other cases. The error involved by using equation (10) when equation (9) should be employed is often serious; it is always sufficient to render abortive any attempt to apply the manometric efficiency to any of the problems here discussed. In other works, and in papers by persons who should have known better but apparently do not, is to be found the expression $H = \frac{v^2}{2g}$

To illustrate the manner of applying equation (9) consider the case of a Sirocco fan 5 ft. in diameter and 6 ft. wide, running at 300 r.p.m. having vanes inclined forward at 45 deg. and delivering 90,000 cu.ft. of air at 2-in. water-gage. Here, as there are five revolutions per second, and as the circumference is 5π ft.,

$$v = 5 \times 5\pi = 78.6 \text{ ft. per sec.}$$

From equation (8):

$$u = \frac{\frac{90{,}000}{60}}{30\pi} = 15.9 \text{ ft. per sec.}$$

From equation (9):

$$H = \frac{v^2 + vu \tan 45}{g} = 230.5 \text{ ft.}$$

Taking 0.075 lb. as an average value for w, the weight of a cubic foot of fan-drift air, the equivalent pressure in pounds per square foot is 230.5×0.075, or 17.3.

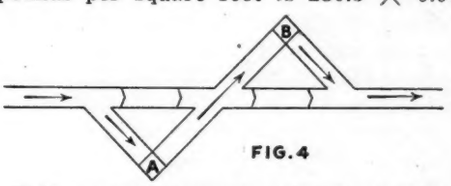


FIG. 4

FIG. 5

FIGS. 4 AND 5—SERIES AND PARALLEL FANS RESPECTIVELY

The author counsels, as have all other authorities, against series fans even where their manometric efficiency is high. It is better to run a single fan at a high speed. Where the manometric efficiency is low two fans deliver little more than one running at the same speed. Fans in parallel have a theoretical advantage and that is particularly evident where the manometric efficiency is quite low—that is, where the fan is based more in overcoming its own resistance than that of the mine. However, both fans in parallel must have precisely equal speed or one fan may draw air backward and through the other or at least take the most of the air.

The actual pressure realized, in the same units, is 5.2×2, or 10.4. Hence the manometric efficiency is $\frac{10.4}{17.3}$ or 60 per cent.

A large number of experiments on fans of various kinds have proved that when the mine resistance is kept constant the volume of air delivered per minute varies directly with the speed or if n be the number of revolutions per minute, and k a constant,

$$Q = kn \qquad (11)$$

A number of important conclusions follow from this simple relationship. For example, p varies as Q^2; therefore p varies as n^2, a result that is verified by experiment. Also power consumption varies as Q^3; hence power varies as n^3. Again, v varies as n and q as Q; therefore from equation (8), u varies as v, or the radial component of the air flowing from the wheel is proportional to the tangential velocity of the periphery of the wheel.

Let $\frac{u}{v} = c$; then equation (9) becomes

$$H = \frac{v^2}{g}(1 + c \tan \theta) \qquad (12)$$

As the terms in the brackets are constant so long as the mine resistance remains constant, and as H has been shown to be proportional to the total pressure, P, needed to circulate the air, again the combined resistance of fan and mine, we have P varies as v^2 and also as n^2, but, as just stated, p also is proportional to n^2. Hence the manometric efficiency $\left(\frac{p}{P}\right)$ is constant and

independent of the speed of the fan so long as the mine resistance is kept constant. As the manometric efficiency has been shown above to be equal to $\frac{R}{R+r}$, the satisfactory conclusion is reached that r, the resistance of the fan, also is independent of the speed of the fan.

Dozens of otherwise useful fan tests have been spoiled by taking the water-gage incorrectly. Most engineers now realize, however, that the end of the gage tube should be turned to face to windward as in Fig. 3 (*a*); otherwise the pressure or depression registered becomes affected by the velocity of the air, which in fan drifts is high. With either of the arrangements (*b*) or (*c*) it is quite possible, by placing

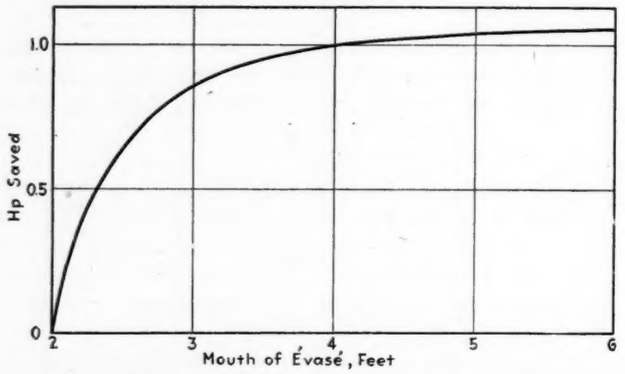


FIG. 6—SHOWING POWER SAVED BY ÉVASÉ DISCHARGE

Assuming that the discharge opening is 2 ft. square, this diagram shows the horsepower saved by expanding the air in an *évasé* chimney with openings of various sizes up to 6x6 ft. Nothing is gained by an extremely large opening, as the curve shows, and it is important that the opening do not expand too rapidly, certainly not at an angle of more than 14 deg. The figures are based on a flow of air of 12,000 cu.ft. per minute.

the tube at a point where the velocity is sufficiently high, to obtain a zero or even a negative gage reading with a forcing fan or to obtain a fantastically high reading with a suction fan. In rapidly moving air there is a marked difference between the readings of gages connected to tubes (*b*) and (*c*); the latter, besides being diminished (for a forcing fan) by the velocity head, is still further reduced by a species of ejector suction possibly resulting from an eddy in the mouth of the tube.

Difficulty often is met in reading the gage with sufficient exactitude owing to the oscillations of the surface of the water in the manometer, and many attempts have been made to damp the vibration by introducing a resistance at the bottom of the U-tube or elsewhere. It is inadvisable, however, to put in resistance at such a point; it becomes effectual only when the sensitiveness of the gage has been seriously diminished. After a number of trials of other methods I found that the best manner of steadying a gage is to make it large.

If the manometer be formed of a glass tube of 1-in. bore and having limbs 3 or 4 ft. long it is as sensitive as a small gage and the inertia of the water is sufficient to prevent rapid oscillations. It is important that the glass tube be thoroughly clean, or the meniscus does not form properly. A little ox gall in the water helps to keep the surfaces clean. A better way is to use gasoline or benzine instead of water; for these liquids, besides being lighter, are grease solvents and keep the tube clean.

The possibility of increasing the air volume by installing a second fan to run in series with the first has exercised the minds of many. When it has been tried the increase usually has been disappointing, though the adoption of fans underground working in series with a surface fan is a common expedient.[2]

Consider an arrangement such as that of Fig. 4, where there are two fans, A and B, which can be run either independently or in series. Let us assume that they are identical in every way. The resistance of the mine is R atkinsons, and that of either fan r atkinsons.

A test carried out with a single fan running enables the manometric efficiency to be ascertained, whence, by the aid of equation (5), the relation between R and r is determinable. When one fan only is running, the doors adjacent to the other being open, the total resistance is $(R + r)$ and from (3)

$$P_1 = (R + r)Q_1^2$$

Hence

Net power supplied to one fan

$$= P_1Q_1 = (R + r)Q_1^3 \qquad (13)$$

When the fans operate in series, delivering a volume Q_2, the total resistance of the system is $(R + 2r)$ and the total pressure required to overcome it is P_2, where: $P_2 = (R + 2r)Q_2^2$ or

Net power supplied to two fans in series

$$= P_2Q_2 = (R + 2r)Q_2^3 \qquad (14)$$

Let us inquire what happens when the power supplied to the fans in series is equal to the *sum* of the powers that would be supplied to the fans were they to run singly. From equations (13) and (14):

$$(R + 2r)Q_2^3 = 2(R + r)Q_1^3$$

$$\text{or } Q_2 = Q_1\sqrt[3]{\frac{2(R + r)}{R + 2r}} \qquad (15)$$

It may be interesting to compare the results obtainable in this way when the fans have manometric efficiencies of 100, 67, and 50 per cent. For the perfect or 100 per cent efficient fan, $r = 0$; and, as has been shown above, for the 67 per cent fan, $r = \frac{R}{2}$, while for the 50 per cent fan, $r = R$. After applying equation (15) to each of these cases the results may be tabulated thus:

Manometric Efficiency	$\frac{r}{R}$	$\frac{Q_2}{Q_1}$
Per Cent		
100	0	1.2*
67	0.5	1.14
50	1	1.10

* This result was derived in the paper previously mentioned where a less rigorous method of analysis was followed. It is now seen to be correct only when the resistance of the fan is negligible, a condition never obtained in practice.

Had the same power been applied to one of the fans as has now been given to the two in series (and it could be so applied by increasing the speed of the fan by 26 per cent) the resulting increase in volume delivered by that fan running alone would have been 26 per cent. From the point of view of power consumption then it is clearly preferable to endeavor to increase the air discharge by speeding up a single fan rather than to place another fan in series with it; moreover, the lower the manometric efficiency the less effectual is the latter expedient.

In a few mines the circulation of air is altogether provided by means of underground fans operating in separate seams or in different sections of the same seam. Such fans work in parallel. In other cases there are two fans at the surface which can be arranged to operate either singly or in parallel. We will consider

[2] See "Uses for Underground Fans," by H. Briggs; *Coal Age*, vol. 8, 1915, p. 370.

the latter instance (see Fig. 5, where two exhausting fans are shown), and will assume the fans to be identical in every way, and to be running at the same speed.

When both are working each will deliver half the total volume passing, or $\frac{Q_2}{2}$ and the relation:

$$p_0 = r\left(\frac{Q_2}{2}\right)^2 = \frac{rQ_2^2}{4}$$

will hold true for the pressure needed to overcome the resistance of either machine. The usual formula: $p = RQ_2^2$ expresses the pressure required to overcome the mine resistance. Hence the total pressure to be exercised is $P_2 = \left(R + \frac{r}{4}\right) Q_2^2$ and the power to be applied $= P_2Q_2 = \left(R + \frac{r}{4}\right) Q_2^3$. The equivalent relation for a single fan is $(R + r)Q$. If these powers are made equal it is clear that a greater volume will be circulated when the fans are in parallel than when one is running alone. The benefit will be the greater the higher the resistance of the fans, and would in fact be zero if that resistance be negligibly small. An interesting exercise may in this case be made by comparing the power consumption when the quantity of air is kept the same, or when $Q_1 = Q_2$; that comparison is here set forth:

Manometric Efficiency	$\frac{r}{R}$	$\frac{\text{Power when both fans run}}{\text{Power when one runs}}$
100	0	1
67	0.5	0.75
50	1	0.62

To sum up: The conclusions as to fans in parallel differ radically from those relating to fans in series. The advantage of parallel running is small when the manometric efficiencies are high, but if those efficiencies are low considerable power is saved by that manner of operation. Experience shows that fans in parallel require careful speed regulation, and a ready means of speed adjustment thus becomes imperative. A small drop of speed in one causes the second to draw air in the reverse direction through it, with a corresponding increase of the load on the second fan.

The expanding, *évasé* or discharge duct of a fan, first introduced by Guibal, is, when correctly designed, an important means of improving efficiency. The function of a fan, like that of a battery on an electric circuit, is merely to produce a difference of pressure; any kinetic energy carried away by the air is so much energy wasted. The *évasé* effects a conversion from kinetic energy into pressure energy.

The chimneys used for suction fans may expand on opposite sides only, the other sides being parallel, or all four sides may be inclined outward. We shall here consider the latter form.

If the base or throat of an *évasé* be a ft. square, and the mouth b ft. square; if q cu.ft. per second be the volume of air passing up the chimney, and w lb. the weight of a cubic foot of air, then the air-velocity at the throat is $\frac{q}{a^2}$ and at the mouth $\frac{q}{b^2}$; hence, if the *évasé* is perfect in operation the saving in kinetic energy effected by the chimney

$$= \frac{qw}{2g}\left(\frac{q}{a^2}\right)^2 - \frac{qw}{2g}\left(\frac{q}{b^2}\right)^2$$

$$= \frac{q^3w}{2g}\left(\frac{1}{a^4} - \frac{1}{b^4}\right) \text{ ft.-lb. per sec.} \qquad (16)$$

In practice the term $\left(\frac{1}{b^4}\right)$ is so small in comparison with $\left(\frac{1}{a^4}\right)$ that it often may be neglected; for example, if $a = 2$, and $b = 4$ ft., the second term in the brackets is $\frac{1}{256}$ while the first is $\frac{1}{16}$; the error due to disregarding the former entirely would thus be only 6 per cent. We gather from equation (16) that the first part of the chimney is the most important. This fact is well shown by Fig. 6, which relates to an *évasé* 2 ft. square at the base and delivering 12,000 cu.ft. of air per minute ($q = 200$). If the air is allowed to escape direct from the 2 x 2-ft. opening, 1.06 hp. is lost in the form of kinetic energy; if a chimney expanding from 2 ft. square to 2 ft. 6 in. square were adopted a saving of 0.63 hp. would be effected. The saving would be 1.0 hp. if the chimney were enlarged until the mouth was 4 ft. square. Any further increase of size beyond that figure is of negligible service.

As a matter of fact it is highly doubtful whether a fan *évasé* ever effects more than 50 per cent of the saving indicated by equation (16). Many years ago Hennan and Gilbert carried out experiments on expanding chimneys of which two sides were parallel, and the others were capable of being set at different angles. Most of the efficiencies of *évasés* as determined by them lay between 40 and 50 per cent.

A duct of this character which expands too quickly is almost useless; the air stream does not fill it, choosing rather to follow one side or corner and producing a re-entrant current at the opposite side or corner. My experiments on air issuing from an orifice indicate that the stream expands at an angle of about 14 deg. The angle between opposite sides of a chimney square in section should be less than this, and one of 10 deg. is satisfactory. The further the inlet to the *évasé* is removed from the revolving blades the better the result.

WASTE FUELS ARE GROUPED by the U. S. Bureau of Mines into two distinct classes—"Autocombustibles," which maintain their own combustion after ignition, and combustibles which will not burn without the addition of heat from an outside source or without mixture with an autocombustible. This second class may be termed for convenience "semicombustibles." With the improvement of furnaces for handling waste fuels, certain materials that were previously considered as semicombustible have joined the list of autocombustible fuels. Semicombustible fuels resist self-ignition mainly because they contain excessive moisture, ash and refuse, and have a physical structure that tends either to resist the passage of the draft or to form large openings in the fuel bed that admit much more air than is required for combustion; too little or too much air lowers the furnace temperature and the conditions that make for efficiency.

The Washington Society of Engineers and the Washington section of the American Society of Mechanical Engineers, in sending out an invitation to a joint meeting to be held this week, ran the following line of black-face capital letters on the invitation: "Order your coal early." Nothing pertaining to coal is to be discussed at the meeting. It apparently is an effort on the part of these societies to uphold the hands of the U. S. Coal Commission and of the Federal Fuel Distributor in the face of adverse criticism, in their advice to lay in stocks of coal at as early a time as possible.

Problems of Operating Men

Edited by James T. Beard

Featuring a Mine Explosion at Universal City, California

Filming a Mine Disaster—Chance to Instruct Public Regarding Mining Conditions—Picture Fails Because Mining Men Were Not Consulted

A MOVING picture director once told me that when he wanted advice on scenes involving mining operations he called on somebody at Los Angeles. That procedure might be all right for certain operations, such as those connected with metal mining, but for suggestions suitable to depict an explosion of gas at a coal mine our producer would have been wise if he had called on an engineer from, say the Pittsburgh district. Furthermore, to give the correct sequence of events in a scenario he should follow the story upon which the film is based.

I refer to a moving picture recently released by the Universal Pictures Corporation, and shown in New York and Pittsburgh, under the title of "The Flame of Life." A full-page ad. in *The Saturday Evening Post* of Feb. 5 drew my attention to the forthcoming production, and I lay in wait for it, as also did others. The picture is based on "That Lass o' Lowrie's," a novel by Frances Hodgson Burnett, and the locale of the scenes is at the coal-mining town of Riggan, Lancashire, England, in the seventies, when the early Davy safety lamps were used.

Opportunity to Educate Public in Mining Lost Because Film Portrays Unsafe Acts

This story affords a good chance to instruct the people in non-technical language, and at the same time to broadcast a lesson on the ventilation of gassy mines and the dangers from miners tampering with safety lamps and smoking underground. But the chance was lost. And to cap it all, after the explosion, at a dozen intervals of a minute or so there were great tongues of flame darting out of rooms into the entries and also out of the pit mouth. In spite of this flame shooting from the shaft, the heroine, with long hair, unprotected and nicely combed, clambered down to the bottom uninjured. There she pushed her way through an excited crowd of miners and eventually saved the "overman" (foreman), her lover, just as he was being swirled away by a rushing torrent of water (feet deep), presumably let loose by the explosion. Of course that was before the days of organized rescue crews or apparatus of any kind, and the heroine with others just battled against the afterdamp, although they were nearly overcome several times.

That's what the picture showed the public. But the real story briefly runs like this: This particular mine, and also near-by collieries, was gaseous. There had been explosions. Ventilation was effected by means of furnaces at the shaft bottoms, and at one mine, the return air, laden with methane, had been ignited at a furnace, with disastrous results. Derrick, a progressive overman at the mine of the story, had studied ventilating fans in Belgium, and wished to introduce them in place of the furnaces. But he encountered much opposition from miners and owners alike. Both were accustomed to a few casualties, which did not rouse anxiety unless there was a large loss of life.

Dangerous Practices of Miners Displayed as Prominent Features of Film

While Davy key-locked safety lamps were used, some of the men had keys, and lit their pipes from the flame of the lamp. Old Dan Lowrie was the worst offender, and hated the overman; but eventually he was caught and discharged. He tried to murder the overman, but was himself murdered on the surface, and not by a fall of roof underground, as shown in the picture. After repeated efforts to induce the owners to install fans the overman resigned, but on his last day, when underground, an explosion took place. A parson and Lowrie's daughter joined the rescuers and went below, and found the overman in a "gallery" (entry) which was perfectly dry. He recovered; the owners reinstated him, and adopted his plans for ventilation.

When will the moving pictures try to do the thing properly, A coal-mining engineer could have put them straight in a few minutes; so would the many mining films on file with the U. S. Bureau of Mines at its Pittsburgh Experiment Station.

Of course there were other scenes in this picture which were fairly well portrayed, but they concerned the sorting of the slate from the coal, and the everyday life of the people of Riggan, including the drinking bouts of Dan Lowrie, the inevitable fight, and a sentimental scene or two. And, by the way, the acting of the overman was pretty good.

Pittsburgh, Pa. M. W. von Bernewitz.

Relative Safety of Safety Lamps

Study intention of protective parts—Principle of wire gauze—Purpose of shield or bonnet—Precautions in removing gas and use of lamp.

WHEN reading the letter of W. H. Moore, regarding the relative safety of safety lamps, *Coal Age*, Jan. 25, p. 184, it seemed to me that the proper assembling and testing of a flame safety lamp are not the only important matters to which attention should be given in the use of the lamp. We should study carefully the intention and purpose of each protective part and use the lamp in a way that will not violate such purpose.

The account given by Mr. Moore, in reference to the supposed failure of the Wolf double-gauze safety lamp carried by the fireboss, at the time of the Wakesiah mine explosion, Nanaimo, B. C., leads me to think that

one or more of the vital principles of the lamp were violated by the fireboss and he suffered the penalty of his disregard of what makes a safety lamp safe.

In the first place, it is hardly necessary to refer to the oft repeated principle of the wire gauze that protects all openings in a safety lamp. It is well known that the wire must be kept cool so as to cool the hot or burning gas within the lamp, as the tiny streams of gas and air pass out through the mesh of the gauze. The temperature must be kept below the temperature of ignition of the gas in order to prevent the passage of flame through the gauze.

Lamp Unsafe in Strong Air Current

Besides keeping the gauze cool, there is another important item to be considered; namely, guarding the lamp against a strong air current traveling at a high velocity. The bonnet of the Wolf lamp, or the shield of the Davy is intended to protect the flame of the lamp in this regard. A high velocity of the air striking the lamp greatly assists the miniature streams of air and gas in passing through the mesh of the gauze.

Experiments have shown that an unbonneted Davy lamp is unsafe when exposed to a current having a velocity greater than 6 ft. per sec.; and the bonneted Wolf lamp is found likewise unsafe in a current of over 40 ft. per sec. Mr. Moore expresses the belief that, in the Wakesiah disaster the lamp had become heated by long use during seven hours prior to the explosion.

In addition to this heated condition of the lamp and with a full knowledge of the fact, the fireboss appears to have carried the lamp up the pitch against a current that Mr. Moore estimates as having a velocity of anything from 2,000 to 3,500 ft. per min., which would be considerably in advance of the safe limit of the Wolf lamp.

Constructive Principle of Lamp Violated

Assuming this summation is correct, who will deny that the constructive principles of the safety lamp were grossly violated and two lives were forfeited by reason of the act. Considering the plain intent of the wire-gauze chimney and the protecting bonnet with which the Wolf lamp was equipped, was not the safety value of the lamp depreciated when the fireboss carried his heated lamp against a strong current of air highly charged with gas?

A word, before closing, regarding the safe removal of a body of gas accumulated in a lodgment in the roof, as in this case. To attempt to remove such explosive gas at a high velocity is extremely dangerous. More time should be taken to enable the gas to be moved at a low velocity that would be safe.

A common error among mining men is to use any means that will drive out a body of gas in the quickest way possible. As in this instance, compressed air under high pressure is often employed, the air blast being directed against the gas at a very high velocity.

Brushing Gas a Dangerous Practice

Accumulated gas should always be moved by the ventilating current. Any method of brushing out the gas with a coat or a gunnysack, or blowing it out with compressed air involves many risks and should be prohibited by the law in every coal-mining state, as it is in many. The ventilating current should be made to sweep all cavities or lodgments in a manner that will prevent gas from accumulating in such places.

By way of summation, let me repeat the following precautions that should be taken in working a gassy seam:

Remove all gases with the ventilating current of the mine properly directed, and use no other means for that purpose. Allow no workmen in the mine, other than those employed in the work when removing a large body of gas. Gas should never be disturbed from its lodgment, however small the accumulation may be, without first notifying and withdrawing all men working on the return air current.

Test all flame safety lamps before they are taken into the mine, using for that purpose an explosive mixture, in a manner similar to that described in *Coal Age*, Dec. 28, p. 1042. Avoid any rapid movement of a safety lamp. When testing for gas never expose the lamp longer than to observe the first indication of a flame cap. Such indication is a sufficient warning to remove the lamp slowly and promptly from the mixture. Never expose a lamp to a high velocity of the current.

If an electric cap lamp is used, never break any connection or contact in order to cut out the light; but when making a test, the glare of the electric light should be prevented by screening the lamp.

Walsenburg, Colo. William H. James.

Bumping in Pillarwork

Instances of bumps in drawing back pillars—Bumping distinct from outbursts of gas in virgin coal—Flushing as a means of preventing bumps.

With much interest I read the letter of R. W. H., writing from Victoria, B. C., on the subject of outbursts of gas and bumps. In taking exception to the suggestion of a previous writer regarding the efficacy of the proposed stowing of waste in the worked-out portions of mines to prevent the occurrence of bumps, he asks if that writer had ever known of bumps occurring in worked-out areas.

If he will permit me, I can refer him to at least three instances where severe bumps occurred in mine areas or sections from which the pillars were being removed. Two such instances occurred in the State of Washington and one in the State of Wyoming. In neither case did the bumping occur in the live workings, which would seem to refute the idea he sets forth that bumps are always associated with the working of solid coal.

Severe Bumps Occur in Worked-Out Areas, Under Similar Conditions

In these three instances there is much similarity in respect to the surrounding conditions. In each case the bumping began in areas from which the pillar coal was being removed, under a depth ranging from 1,800 to 2,100 ft. of vertical cover, the roof being exceedingly strong while the floor was much weaker. The bumping was severe and resulted in the killing of three men and three locomotives were buried on the haulage roads.

In my opinion, there is an absolute distinction between outbursts of gas in virgin coal and bumps such as these occurring in areas from which the pillars are being removed. In the State of Washington, outbursts of gas have occurred in the solid coal of the advance workings. The same phenomenon occurred, also, in a mine on Vancouver Island and in several mines of the Crows Nest Pass district of British Columbia.

To my mind, the question of bumps in coal mining is an important one and should receive the serious consideration of mining men, both in the States and in Canada. It would be deeply interesting if the matter could be discussed in *Coal Age* and the experiences given of men who have studied the subject from an intimate association with such occurrences.

Facts and Data Regarding Occurrence of Bumps and Outbursts of Gas Wanted

Undoubtedly, the narration of incidents and citation of facts would throw much light on conditions in the mines that invite or make possible these occurrences. As far as practicable, measurements of the quantities of gas set free should be given, the condition of the mine described, and the possible relation of the bumping to the area worked out and the depth of cover and character of the roof and floor.

Personally, I am of the opinion that the proposed method of filling worked-out areas in mines, by the stowing of waste or by flushing, as the case may be, would be helpful in preventing the occurrence of bumps in areas from which pillars are to be removed.

However, the distance of movement of the roof, under the enormous pressure due to the weight of the overburden, can be comparatively small and still create a considerable disturbance within the area when the roof lets go. For this reason, the filling of the waste must be reasonably complete and the material well settled if good results are to be accomplished.

G. W. Evans,
Seattle, Wash. Consulting Coal-Mining Engineer.

Inquiries Of General Interest

Gobbing Slate in Rooms in Mines

Rooms Turned Right and Left Off Pair of Entries—Slate to Be Gobbed in Each Room —Manner of Gobbing Depends on Conditions

HAVING recently opened a mine on the room-and-pillar system and being desirous of securing the best possible economic results in respect to cost of operation and complete extraction of the coal, I take the liberty of asking the opinions of *Coal Age* and its practical readers regarding the most feasible and best method of gobbing the slate that must be taken down in the rooms.

In deciding this question we wish to have in mind and take into consideration the later extraction of the pillars, driving of breakthroughs, trackwork and timbering of roads. Realizing that each and all of these features have an important bearing on the economic working of a coal mine, we desire to start right.

The question we would like to ask is, Which is the most practical side to gob the slate in these rooms? It would be interesting to have the various features of gobbing slate in rooms broadly discussed and hoping for this we shall watch these columns each week to learn something new.

A. L. Trimble,
Big Shoal, Ky. James Hatcher Coal Co.

The question of the most practicable method of gobbing slate, in driving rooms in mines, is so closely allied to many other features that unfortunately are omitted, it is only possible to reply in a very general way to this inquiry.

In the first place, conditions may make it advisable to drive double rooms, with track laid along each rib to facilitate the taking out of the wide pillars separating the rooms. In that case, the slate is gobbed in the center of the room between the tracks.

In driving single rooms, the track is generally laid along the straight rib and the slate is then gobbed on the opposite of the track, keeping it clear of the other rib so as not to hinder the drawing of that pillar. Under certain favorable conditions of roof and floor, it often becomes advisable to lay the track in the center of a wide room, gobbing the slate on one side of the track only, preferably the low side.

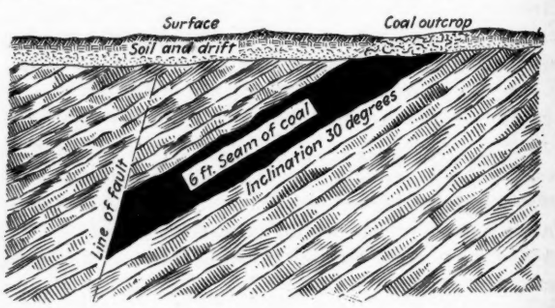
Locating the Coal Beyond a Fault

Bore holes in roof and floor to determine whether fault is normal or reverse—If normal, follow the greater angle the seam makes with the line of fault—If reverse, follow the lesser angle.

SINCE reading recent references to finding the coal beyond a fault, which have appeared in *Coal Age*, I am anxious to present a case that has puzzled us and which, as yet, we have not been able to solve. As shown in my sketch, we have a 6-ft. seam of coal outcropping on the surface and dipping at an angle of about 30 deg. We were driving a slope in this seam and had gotten down to a considerable depth when the coal was suddenly cut off by the slip or fault such as I have shown in my sketch. All efforts to find the coal beyond this point have, thus far, proved unavailing and I would like to ask how we should proceed with some assurance of success.

Joseph Lawrence.
Hazleton, Pa.

Judging from the sketch, which is here shown in the accompanying figure, assuming the fault to be normal,



FAULTED SEAM DIFFICULT TO EXPLOIT

it is a downthrow. This, however, must be determined before the work of finding the continuation of the seam can be prosecuted with any assurance of success. It may happen that the fault is a reverse fault, in which case it would be an upthrow.

In order to determine whether the fault is normal or reverse, a borehole must be sunk in the floor if the lesser angle between the fault line and the seam is at the roof; or a borehole must be put up in the roof if the lesser angle is at the floor. If the fault is a reverse,

one of these boreholes should find the coal if extended sufficiently far. If the fault is normal, the borehole will not reach the coal in either case.

Again, if the fault is normal, the continuation of the seam will be found by following the direction of the lesser angle. In the case of the reverse fault, it is necessary to follow the greater angle to find the continuation of the seam.

Examination Questions Answered

Examinations Under the Mine Act, Alberta, June, 1922

(Selected Questions)

QUESTION—*Give the relative advantages and disadvantages of the Wolf and Edison safety lamps. State under what conditions you would adopt the use of either of them. Give reasons.*

ANSWER—There is no Edison safety lamp. As has often been explained in *Coal Age*, the term "safety lamp" has reference to a gauze-protected lamp designed to admit air and gas to the combustion chamber, while the passage of flame to the outside air is prevented by the cooling effect of the wire gauze. The question probably refers to the Edison electric cap lamp, as compared with the Wolf flame safety lamp. Both of these types of lamp are in common use in mines.

The Wolf lamp is particularly useful in determining the percentage of gas present in mine air, by observing the effect of the gas on the flame of the lamp. This is one of the chief advantages of that lamp over the electric cap lamp. The Edison lamp possesses the advantage, however, of giving a bright light that greatly reduces the danger of accident in mine workings. While the electric lamp has the advantage of reducing to a minimum the possibility of the ignition of gas in the mine, the lamp affords no means of detecting the presence of gas, which is its chief disadvantage. The principal disadvantage of the Wolf lamp is its liability to extinction when being introduced into a body of gas. Owing to the highly inflammable oil burned in the lamp there is often produced what is called a "fuel cap," formed by the volatile oil and which is often mistaken for a gas cap when practically no gas is present.

The Wolf lamp should be adopted and used for the examination of any mine generating gas. In general, the Edison electric lamp gives better service as a working lamp, in mines generating gas or dust. The electric lamp is also far superior to the open torch where a mine generates no gas.

QUESTION—*If it requires 10 hp. to pass 20,000 cu.ft. of air per minute through a mine, the pressure being 5 lb. per sq.ft., how many horsepower will be required to pass 25,000 cu.ft. per min., under the same pressure?*

ANSWER—For a constant pressure, the horsepower required to circulate air in a mine varies with the circulation, which gives the proportion, calling the required horsepower x,

$$x : 10 :: 25{,}000 : 20{,}000 = 12.5 \text{ hp.}$$

QUESTION—*In a mine where shotfiring is carried on, it is noticed that at different times the air contains approximately 2 per cent of methane (CH_4), but this does not occur at regular intervals. The coal is of a very hard nature and it is essential that shotfiring be done. State what is the highest percentage of gas in the air in which you would allow shotfiring to be carried on and what steps you would take to see that your orders were being obeyed.*

ANSWER—From the statement of the question, it appears that shotfiring must be performed in the working of this mine, owing to the hardness of the coal. It also appears that gas is generated at irregular intervals to such an extent that the mine air is charged with 2 per cent of gas, which would be a dangerous condition in the working of a softer or more inflammable coal. However, in this mine, it is important that, not only should the morning examination be carefully made, but competent firebosses should be in charge throughout the day, each having charge of a limited section of the workings. No shots should be permitted to be fired without having first been examined by the fireboss and the place tested for gas. Preferably all shotholes drilled by the miners should be examined, charged and fired by competent shotlighters, after the men have gone home. Constant inspection should determine any violation of the rules and such should be promptly and suitably furnished.

QUESTION—*Describe in detail how you would place the shotholes in driving an entry 10 ft. wide and 8 ft. high; and state how you would arrange the work so that drilling and loading could take place simultaneously. State the number of men you would employ on each shift.*

ANSWER—Much will depend on the hardness of the coal, but ordinarily it may be assumed that the coal at the face of this 10-ft. heading should be sidecut and mined before any holes are drilled or fired. The placing of the shots will depend on the character of the seam in respect to any partings that would make it advisable to work out the coal in benches. Also, much will depend on the relative hardness of the several layers making up the full height of the seam.

However, assuming a uniform quality of the coal from the top to the bottom of the seam, good results will probably be obtained by starting the first row of holes about the center of the coal face. These holes should be given a slight inclination toward the sidecut. Perhaps two holes will be all that will be required to break down the coal in this half of the heading. Care must be taken not to drill the holes beyond the depth of the sidecut or mining.

With proper care, the coal on each side of this heading can be worked out alternately, by shooting first on one side and then on the other. It may not be necessary to sidecut the coal on more than one side of the heading. Instead, the holes for the extraction of the second half of the face may be drilled as close as convenient to the rib. Experience will determine the best position of the holes and the number required. In any case, care must be taken not to locate the charts in the upper hole too close to the roof, to avoid danger of shattering the roof slate. In this arrangement, mucking and loading out of the coal can proceed on one side of the heading, while drilling is in progress on the other side. In general, two or three men at the most should be employed on each shift.

Strike Fails in Central Pennsylvania

The second edition of the 1922 strike in central Pennsylvania, which the United Mine Workers of America called on Monday, April 2, is a failure, so far as the union is concerned, resulting in tying up for a time the mines of the Bird Coal Co., at Kelso, and the Cambria Fuel Co., both in Somerset County, but on the other hand resulting in a large number of union miners who have been out on strike at Windber for one year applying for their old places when they saw there was nothing doing there.

When the strikers at Windber found they were not being backed, many of the men sought their old places, it being apparent that there would be nothing doing this summer and as the strike was called only to force recognition of the union and the collection of the check-off, they had nothing to gain, as the open shop mines are paying union wages and working the eight-hour day.

Because of embargoes on roads controlling the northeastern market and a continued inadequate car supply, conditions are improving but little in the central Pennsylvania field. The car supply on the Pennsylvania lines is but little in advance of 25 per cent. Production in the district during the month of March was 77,518 cars, as compared with 69,297 cars in February.

Normally there are approximately 13,000 men employed in the Somerset field, affected by the strike call. Approximately 1,200 have been on strike for one year. J. C. Brydon, president of the Somerset Coal Operators' Association, states that these men are divided into three groups: First, those who are following their honest convictions; second, those who are satisfied to accept the relief and are not anxious to resume work, and third, those who refuse to work under any conditions as long as they can exist without working.

As a result of the dynamiting of a steel car on Sunday night, April 1, at Jenners No. 2, Somerset County, all bridges and tunnels on the Somerset and Cambria branch of the Baltimore & Ohio R.R. are being guarded. John Brophy, president of District No. 2, issued an order to union men against violence, urging them to respect the law and property. It has not been fully determined who placed the charge of dynamite under the car at Jenners.

A slight disturbance occurred at Carpenter Park, where the Cambria Fuel Co. operates. It is charged that a crowd of women and children threw pepper into the faces of two deputy sheriffs as they were on their way to the mines. Two women were slightly injured when the deputies fired several shots to scatter the mob. The injured were taken to Johnstown for treatment and later taken to their homes.

Judge John Berkey, hearing the cases in the Somerset County Court against twenty-five men and women charged with contempt of court, the charge growing out of the strike one year ago, discharged four women and five men. Fifteen women were sentenced and one youth was paroled. The fines ranged from $10 to $100. The fines were paid.

Failure to Reach Agreement in Seattle Keeps 2,000 Idle in Washington

Because no way has been found of breaking the deadlock that ended a wage conference held nearly a month ago, 2,000 union mine workers have drifted into a strike in the Roslyn-Cle Elum coal field. The wage conference held in Seattle between representatives of the Washington Coal Oprators' Association and state district officers of the United Mine Workers ended when the mine workers declined to accept a cut of $1.50 a day in the wages of the day men.

It is the contention of the union representatives that not more than 15 per cent of the mine workers in the Roslyn-Cle Elum field would be affected by the day wage cut, as virtually all the coal is mined under the contract system.

The contention of the employers is that the wages now paid in the Roslyn-Cle Elum field are higher than are paid in the non-union mines of western Washington and that a reduction of the wages down the line would be justified.

The strike affects approximately 2,000 men. Of this number approximately 1,700 are employed in the mines of Northwestern Improvement Co., a subsidiary of the Northern Pacific Ry. The others affected are on the properties of the Roslyn Fuel Co., the Independent Coal & Coke Co. and the Roslyn-Cascade Coal Co. Ten mines will be shut down.

A unionized coal mine at Tono in Lewis County, western Washington, operated by a subsidiary of the Union Pacific R.R., also is involved. This mine employes about 200 men.

Martin J. Flyzik, state district president of the United Mine Workers, and John H. Wallace, commissioner of the Washington Coal Operators' Association, are now in the East to confer with officers of President Harding's fact-finding commission over the Washington situation.

1,000 Kanawha Miners Strike

Approximately 1,000 miners went on strike April 3 at the mines of the Oakland Coal Co., Crescent Coal Co., E. L. Michie and Edwin Marmet, in the Montgomery district of the Kanawha field, according to an announcement by D. C. Kennedy, secretary of the Kanawha Coal Operators' Association.

The strike came at the termination of the individual agreements between the miners and operators, Mr. Kennedy said. A delegation of the striking miners reported to headquarters of District 17, United Mine Workers, their action in refusing to go to work when the agreements expired. E. L. Michie was a member of the operators' scale committee and signed the scale on which the individual contracts were negotiated, Mr. Kennedy said.

Western Kentucky Strike Is Softening

The first sign of disruption has appeared in the ranks of the coal operators of Hopkins, Christian and Webster counties in western Kentucky who refused to sign a one-year contract with the miners' union, thereby drawing a strike on April 1. The Circle City Coal Co., at Nebo, is reported to have signed the one-year contract on the same basis as the rest of the unionized districts of the country. The company's mine employs about seventy-five men. Although there were reports that some of the other forty mines involved in the strike were to be reopened on an open-shop basis, nothing of the sort has occurred. All the rest of western Kentucky is working unaffected since the West Kentucky Coal Operators' Association has already signed with the union for one year.

Contract Not Renewed, Alabama Men Out

About half of the miners at the Beltona mine of the American Fuel Co., near Warrior, Jefferson County, Ala., are reported on strike as a result of refusal of officials of the company to renew the union contract which expired April 1. This was one of the few operations in the Alabama field working under a contract with the United Mine Workers, and it is understood that the management of the company will decline to negotiate another contract with the union. The daily production of the mine is about 1,000 tons.

Union Granted Appeal from McClintic Injunction; Argument May 2

Following arguments made on March 31, the United States Circuit Court of Appeals at Richmond on April 2 granted an appeal to the United Mine Workers of America from the injunction of Judge George W. McClintic, of the United States District Court for the Southern district of West Virginia, prohibiting the use for unionization of non-union mines of funds collected through the check-off from certain coal companies operating on a union basis in the Kanawha field. The appeal operates as a suspension of the injunction of Judge McClintic until a final determination of the case or until further order of the court. The case will come up for final argument at Richmond on May 2. Appearing for the United Mine Workers at the hearing on March 31 was William A. Glasgow, Jr., of Philadelphia, and for the non-union operators were S. B. Avis, A. M. Belcher and E. L. Greever.

Bituminous Coal Stocks Fall 2,000,000 Tons in Month; 22 Days' Supply on Hand March 1

Commercial consumers had in storage approximately 36,000,000 tons of soft coal on March 1, 1923, according to a survey undertaken by the Bureau of the Census and the Geological Survey under authority of the Federal Fuel Distributor. The steady upward trend in stocks since the end of the miners' strike early in September was interrupted in February and the reserves on hand decreased 2,000,000 tons. Stocks on March 1, 1923, were about midway between those on March 1, 1920, when the reserve supply was close to the lowest recorded, and those on March 1, 1922, when a very heavy tonnage had been stored in anticipation of a general strike of union miners.

Measured in tons, stocks decreased 5.3 per cent between Feb. 1 and March 1. Measured in terms of days' supply, the decrease was 8.3 per cent. The larger decrease in days' supply was due to the fact that the rate of consumption increased in February.

Assuming that the stocks were evenly divided, the supply on March 1 was sufficient to last 22 days, against 24 days on Feb. 1. When stocks dropped to 20,000,000 tons on June 1, 1920, the market was seriously disturbed, and on Sept. 1, 1922, when the supply on hand was 22,000,000 tons, there were urgent appeals for coal.

Stocks of anthracite in the yards of retail dealers on March 1 were 40 per cent less than on Feb. 1. The quantity of anthracite on the Lake docks was less than a fifth of what it was a month ago.

TABLE I—ESTIMATED TOTAL COMMERCIAL STOCKS OF BITUMINOUS COAL IN THE UNITED STATES *a*

(In net tons)

Oct. 1, 1916	27,000,000	Aug. 1, 1921	41,100,000
Oct. 1, 1917	28,100,000	Nov. 1, 1921	48,500,000
July 15, 1918	39,700,000	Jan. 1, 1922	48,000,000*b*
Oct. 1, 1918	59,000,000	March 1, 1922	52,500,000*b*
Day of the armistice	63,000,000	April 1, 1922 at least	63,000,000*bc*
Jan. 1, 1919	57,900,000	Sept. 1, 1922	22,000,000*b*
April 1, 1919	40,400,000	Oct. 1, 1922	26,000,000*b*
March 1, 1920	24,000,000	Nov. 1, 1922	32,000,000*b*
June 1, 1920	20,000,000	Jan. 1, 1923	36,000,000*b*
Jan. 1, 1921	45,800,000	Feb. 1, 1923	38,000,000*b*
April 1, 1921	39,500,000	March 1, 1923	36,000,000*b*

(*a*) The figures for 1918 in this table are based upon an actual count. Beginning April 1, 1919, the figures are estimates based upon reports from a selected list of 5,000 consumers whose stocks in 1918 bore a known relation to the known total stocks. (*b*) Subject to revision. (*c*) No canvass of consumers was made on this date. The total stock was estimated from the stock on March 1, ascertained by questionnaire.

The total quantity of soft coal in the hands of commercial consumers on March 1, 1923, was between 34,000,000 and 38,000,000 net tons, probably 36,000,000 tons. In this estimate no account is taken of coal in the cellars of householders, concerning which no statistics are available, nor steamship fuel, nor coal on the Lake docks, which is classed as coal in transit.

From Table I and Fig. 1, which presents the same data graphically, it is seen that coal was withdrawn from storage during February. Observers who have been watching the downward trend in production will not be surprised at the decrease of 2,000,000 tons in stocks. Indeed, the actual draft on available coal was greater than is indicated by the decline in consumers' stocks, as there was an appreciable decrease in the tonnage in transit. There is a considerable lag between the production of coal and its arrival at points of consumption, and the quantity to be accounted for on March 1 was that mined from Jan. 15 to Feb. 15, which was approximately 45,600,000 tons. It is estimated that consumption, including foreign bunker coal, plus exports, during February was approximately 47,600,000 net tons, or at the rate of about 1,700,000 tons per day.

The average stocks for all consumers on March 1 were sufficient to last 22 days at the rate of consumption in February. At the rate of consumption in January the stocks on Feb. 1 would have lasted 24 days. These statistics, shown by classes of consumers in Fig. 2 and in the table below, are based upon reports of tons on hand and actual consumption received from about 5,000 consumers, so selected as to be fairly representative of all commercial consumers. The rate of consumption used in calculating the days' supply on March 1, 1923, was the quantity actually consumed in February. The days' supply on March 1, 1922, was calculated by using the rate of consumption in January and February, 1922.

TABLE II—DAYS' SUPPLY OF BITUMINOUS COAL IN HANDS OF VARIOUS CLASSES OF CONSUMERS IN THE UNITED STATES, JAN. 1, 1919, TO MARCH 1, 1923 *a*

(Figures represent number of days supply would last at current rate of consumption at time of stock taking.)

	Jan. 1, 1919	Mar. 1, 1920	Jan. 1, 1921	Apr. 1, 1921	Jan. 1, 1922	Mar. 1, 1922	Sept. 1, 1922	Oct. 1, 1922	Nov. 1, 1922	Jan. 1, 1923	Feb. 1, 1923	Mar. 1, 1923 *b*
Byproduct coke plants	32	15	29	28	42	39	11	14	18	19	20	19
Steel plants	42	9	42	38	46	48	12	17	21	27	26	26
Other industrials	65	27	64	47	51	56	32	33	39	40	36	34
Coal gas plants	81	31	55	66	89	82	34	38	55	60	62	58
Electric utilities	49	21	44	48	51	54	26	30	32	33	35	34
Coal dealers, bituminous	39	13	30	26	33	23	11	18	21	16	15	11
Railroads	32	11	23	24	35	42	13	15	13	16	18	16
Total bituminous	42	18	39	36	41	43	17*c*	21*c*	23*c*	26*c*	24*c*	22*c*

(*a*) The figures in this table are estimates based on incomplete data. (*b*) See text for rate of consumption at which these figures were calculated. (*c*) Subject to revision.

Fig. 3 shows graphically the variation in stocks in each state. The map shows the days' supply held at general industrial establishments, excluding steel and byproduct coke plants. This is the largest group of consumers and the one that shows best the distribution of stocks. Changes in activity in this group are quickly reflected in the coal market, and likewise changes in the coal market soon become apparent in the reserve stocks of industrials.

Taking the country as a whole, the stocks held by general industrials were sufficient to last 34 days. This was a decrease of 2 days from the supply on Feb. 1, 1923. Comparison with corresponding dates in preceding years shows that the supply would have lasted 7 days longer than the stocks on March 1, 1920, and 22 days less time than those on March 1, 1922. In 23 states the supply on hand was sufficient for less than 30 days. In New England and the Atlantic Coast States, with the exception of New Hampshire, Maryland and North Carolina, the supply would have lasted more than 30 but less than 60 days.

It is evident from the quantity of bituminous coal delivered by the retailers that the deficit in the supply of anthracite has not been entirely made up and that the gap between production and requirements of anthracite is largely being filled with bituminous coal. For this reason

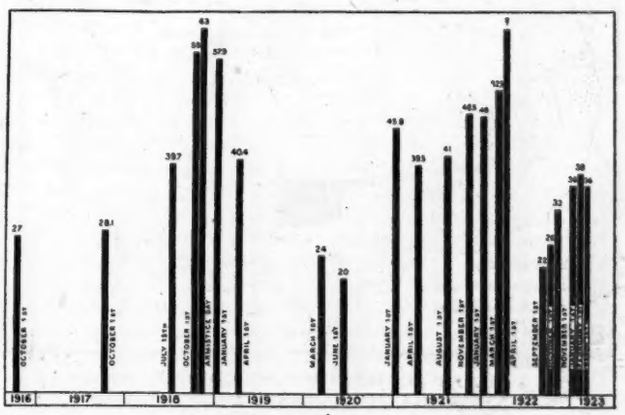


FIG. 1—TOTAL COMMERCIAL STOCKS OF BITUMINOUS COAL, OCT. 1, 1916, TO MARCH 1, 1923

Figures represent million net tons and include coal in hands of railroads, industrial consumers, public utilities and retail dealers. Coal for steamship fuel, on Lake docks and in transit is not included. Figures for 1922 and 1923 are subject to revision.

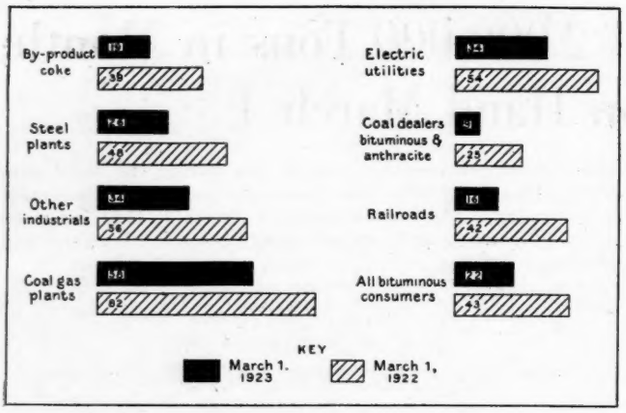


FIG. 2—DAYS' SUPPLY HELD BY DIFFERENT CLASSES OF CONSUMERS ON MARCH 1, 1923, AND MARCH 1, 1922

At the rate soft coal was burned in February, 1923, the stocks on hand March 1 were sufficient to last 22 days. The stocks on March 1, 1922, when heavy reserves had been accumulated in anticipation of a miners' strike, were sufficient to last 43 days at the rate of consumption in January and February, 1922. The stocks on March 1 were sufficient for 2 days less time than those on hand Feb. 1, 1923.

it is desirable to consider bituminous and anthracite combined in the territory where hard coal is burned.

Outside the anthracite territory the situation was as follows: Stocks decreased in every state except Arkansas, Louisiana and Wyoming, where there was no change. Over the country as a whole retailers' stocks of bituminous coal decreased nearly 23 per cent. Increases occurred only in New Hampshire, Massachusetts and Virginia.

The quantity of unbilled coal at the mines increased from 165,000 tons on Feb. 1 to 183,000 tons on March 1, an insignificant part of the available supply. The tonnage at junction points and terminals awaiting reconsignment decreased from 65,000 to 43,000 tons.

Reports from an incomplete list of producers equipped to store show that nearly 950,000 tons were in storage on March 1 at the mines, against 860,000 tons held by the same producers on Feb. 1. The number of producers who store is small, but the quantity in storage may at times be considerable.

Stocks of byproduct coke decreased 40 per cent in February and the quantity on hand on March 1 was but 87,000 tons. This was barely one-tenth the stocks on March 1, 1922, when the reserve was heaviest.

Severe winter weather maintained the demand for anthracite at a high level throughout February, and retailers' deliveries so far exceeded receipts that stocks dropped

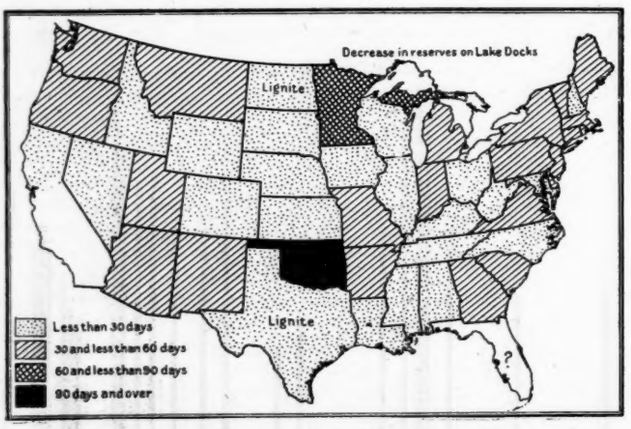


FIG. 3—DAYS' SUPPLY OF SOFT COAL ON HAND AT INDUSTRIAL PLANTS ON MARCH 1, 1923

At the rate of consumption that prevailed in February, 1923, reserve stocks at industrial plants other than steel and byproduct coal would last on the average 34 days. The map shows how the supply varied from state to state. Note the absence of the darker shading which would indicate heavy stocks. Any change in business activity after March 1 which affected coal consumption would be reflected in the days' supply. Based on reports from 2,260 plants.

TABLE III—ANTHRACITE IN YARDS OF A SELECTED LIST OF RETAIL COAL DEALERS *a*

Date	Net Tons	Days' Supply *b*	Date	Net Tons	Days' Supply *b*
1919–Jan. 1	904,712	36	1922–Jan. 1	1,336,953	44
April 1	785,840	31	March 1	1,093,734	28
1920–March 1	727,727	21	1923–Jan. 1	403,605	11
June 1	515,149	15	Feb. 1	356,121	8
1921–Jan. 1	685,615	24	March 1	215,063	6
April 1	1,140,757	36			

(*a*) Based on statements from 368 identical dealers who reported on each date
b) Calculated at current rate of delivery to consumers, which varies.

sharply. The supply in the yards of 368 retail dealers on March 1 was 215,063 net tons, a decrease during February of 141,058 tons, or 40 per cent. Stocks were 80 per cent less than on March 1, 1922, 81 per cent less than on April 1, 1921, and 70 per cent less than on March 1, 1920. Retailers' stocks of anthracite on March 1, 1923, at the rate of delivery in February, would have lasted an average of 6 days, whereas the supply on March 1, 1922, was sufficient for 28 days, and on March 1, 1920, for 21 days.

Anthracite was mined at a high rate in March, but as cold, stormy weather prevailed in most sections of the anthracite-consuming territory during a large part of the month, it does not seem likely that reserves have increased greatly.

Reports from retailers in the anthracite-consuming territory indicate an increased demand for bituminous coal as a

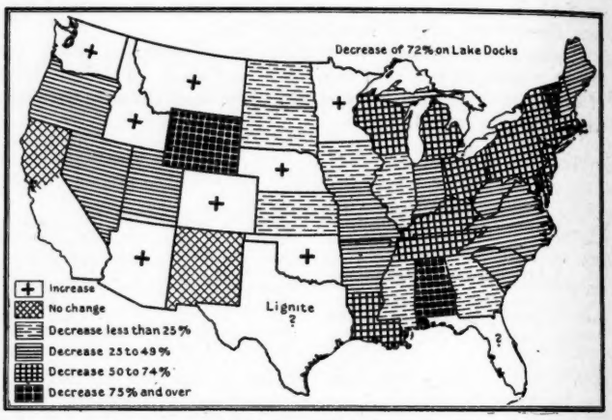


FIG. 4—HOW RETAILERS' STOCKS OF ALL COAL—ANTHRACITE AND BITUMINOUS—ON MARCH 1, 1923, COMPARED WITH THOSE ON MARCH 1, 1922

Stocks of bituminous coal in retail yards decreased in February and on March 1 were 24 per cent less than on Feb. 1. Stocks of anthracite were 40 per cent less than they were a month ago. The map shows how the supply of all coal—bituminous and anthracite—on March 1, 1923, compared with that on the corresponding date in 1922, when retailers had heavy reserves. All states east of the Mississippi except Minnesota had smaller stocks than a year ago.

substitute for anthracite. The February rate of delivery of bituminous coal in that territory was nearly 17 per cent higher than in January, which in turn was 20 per cent higher than the average rate of delivery in November and December, 1922.

Although large quantities of bituminous coal were secured by retail dealers to replace anthracite, demand in February was such that deliveries to consumers exceeded receipts, and total stocks of anthracite and bituminous combined fell off sharply. On March 1, 1923, the total reserve was 14 per cent less than that on Feb. 1, 1923, less than half that on March 1, 1922, and barely three-quarters that on March 1, 1920. The map in Fig. 4 shows how the stocks in each state on March 1, 1923, compared with those on March 1, 1922. It is seen that retailers east of the Mississippi had less coal on hand than a year ago. The only increase worthy of mention was that of 38 per cent in Minnesota, those in the Western States being small and of little importance.

Reports from the Northwestern Coal Dock Operators' Association indicate that the docks had been practically cleared of anthracite on March 1. It is estimated that the total quantity on hand on that date was approximately 10,000 net tons. On Feb. 1, 1922, there was 1,030,170 tons, on March 1, 1922, 821,448 tons, and on Feb. 1, 1923, 57,636 tons.

With Operators', Miners' and Public's Viewpoint Shown Coal Commission May Prescribe New Ethics

By Paul Wooton
Washington Correspondent of *Coal Age*

The outstanding feature of last week and one of the most significant events since the President's Coal Commission was formed, was the presentation of the argument and brief by Henry L. Stimson, counsel for the Bituminous Operators' Special Committee, on the policy and methods of the United Mine Workers of America. This presentation was in response to Governor Marshall's request for specific charges and evidence of violation of the rights of American citizens. There is abundant evidence that the commission realizes that the matters raised in this brief and which will be raised when the United Mine Workers make a similar presentation constitute the most dangerous rapids through which the commission must steer its craft.

The Senate Committee on Education and Labor, under the direction of former Senator Kenyon, of Iowa, undertook a similar investigation. The experience of that body was that it soon was flooded with a mass of testimony from each party to the controversy setting forth isolated cases and drawing from them a considerable variety of deductions. The history of the Kenyon investigation was that one outrage grew out of another and that it was impossible to trace back and ascertain who was responsible for the first overt act. Senator Kenyon soon gave up the effort to fix responsibility. He accepted the abundant evidence that a very unhealthy state of affairs existed and drew up a code of principles which recognized the rights of operators and mine workers and called upon each to put an end to the type of activities in which they were engaging.

It is fully expected that the Coal Commission will follow practically the same course. It is known that it will find indefensible acts for which each of the contesting interests is responsible. Since the police powers are vested in the state the opinion is held by some that the commission can do nothing more than set up a code and recommend that it be followed in the future.

Take Statements with Grain of Salt

There are no salt shakers on the commission's table, but it can be said, nevertheless, that some grains of salt are being added by members of the commission as they digest the statements made to them. It is believed that the commission is of the opinion that there is nothing startling in the effort of the United Mine Workers to unionize all mines. Every labor union seeks as many members as it can get. Unless a union gather into its membership a large proportion of the workers in a particular line of endeavor, collective bargaining would be impracticable. On the other hand, the commission is not surprised and regards as only natural, it is believed, that the non-union operators should resist determinedly all efforts to bring their men within the organization. It is thought that the commission recognizes that the real objection of the non-union operators to the union is not the various reasons usually cited but is the surrender of great market advantages that come with the ability to vary the wage scale in such a way as to take full advantage of the commercial situation.

Governor Marshall already has emphasized the fact that one illegal act does not justify another. It is safe to predict that, with the operators' point of view, the mine workers' point of view and the public's equity well understood and championed by members of the commission, a new code of ethics will be prescribed for the coal industry, with the probabilities favoring a scathing denunciation of various practices which have grown up in the employer-employee relationship at the coal mines. From the information that has become available as to the appearance of Mr. Stimson, some persons judge that the commission is in accord with the operators' contention that strikes constitute the real cause of the recurring shortages of bituminous coal. These shortages may have been prolonged and intensified by other contributing causes, but the operators seem to have established their contentions in that connection.

F. R. Wadleigh, Federal Fuel Distributor, appeared before the commission on April 6, at which time plans were perfected for co-ordination of the studies being made by the two agencies. It also was agreed that the commission would co-operate with the Bureau of Mines and the Federal Fuel Distributor in a study of anthracite standardization and preparation.

The statistical and technical compilations being made by the commission are progressing rapidly. During the first week of April ninety-six persons were added to the commission's staff, bringing the total personnel to 356.

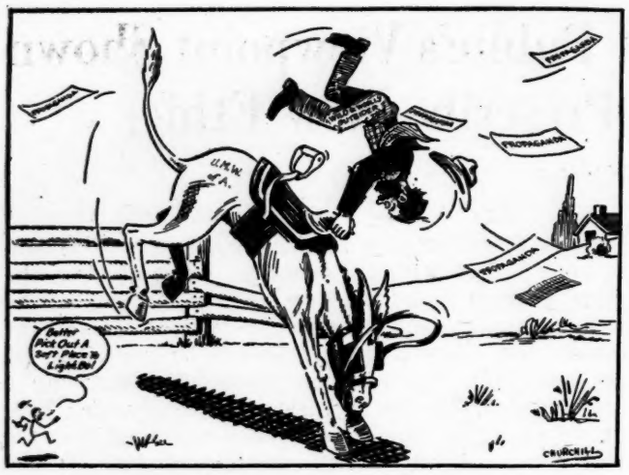
It is probable that the retailers will make certain compilations of their own from duplicate returns on the questionnaires involved in that branch of the business.

C. A. Allen, Field Investigator, Dies

Carl A. Allen, in charge of field investigation of waste in the mining of coal for the U. S. Coal Commission, died of pneumonia Monday, April 9, in the Emergency Hospital, Washington, D. C. He had been ill ten days. The body will be taken to Denver for burial.

Mr. Allen was born in Colorado Springs and was educated at the Colorado School of Mines. Following his graduation he worked for four years as a mining superintendent and as a mining engineer in gold and copper properties, later engaging in consulting work, including problems of coal-mine engineering.

From 1911 to 1913 Mr. Allen was assistant professor of mining at the Colorado School of Mines, where he established a coal-mining course. In 1916 he joined the staff of the U. S. Bureau of Mines and spent a year and a half in charge of one of its mine-rescue cars, operating in the Montana and Wyoming district. In 1918 he was sent to Utah to direct the Bureau investigations in Utah, Wyoming and Idaho. An arrangement was made whereby he was engaged on a part-time basis to serve as the chief mine inspector for the State of Utah and as a member of the State Industrial Commission. His work with the Coal Commission was being done under a leave of absence from his regular duties. When he was taken ill Mr. Allen was engaged in field work in West Virginia for the Coal Commission.



Here's a Mule He Can't Ride

(From the United Mine Workers Journal)

"Not Guilty" Is Second Herrin Verdict; State Drops Remaining Cases

"Not guilty" was the verdict returned at Marion, Ill., in "bloody Williamson" County, April 6, closing the second murder trial growing out of the Herrin massacre of June 22, 1922. Thus a second time the State of Illinois was balked in its attempt to punish members of a mob which besieged a non-union strip mine, accepted the surrender of the 48 men within, and then shot and cut 21 of them to death with a brutality which made the massacre notorious the world over.

There remains a long list of names on the list indicted last autumn by a grand jury. The state, however, has thrown up its hands. All the charges of murder and conspiracy to murder have been *nolle prossed* on motion of Delos Duty, state's attorney, because the state feels that it is impossible to get a conviction before a Williamson County jury, no matter how direct the evidence against the defendants. Only the cases of larceny will be tried. Thus the whole effort of the state halts.

"I am not going to try any more," said Mr. Duty. "I have done my duty to the best of my ability. I have my personal opinion as to who committed those crimes and did all I could to convince two juries. It is a hopeless proposition." Attorney General Brundage, who gave a good deal of his own time to the prosecution, had little to say in Chicago, where he went at the end of the trial. He merely commented that the state couldn't get justice.

Under the law the case must be tried in the county where the crime was committed, so there is no further move to be made by the State of Illinois unless new evidence be found. The United States Department of Justice, which aided in working up the case against the long list of indicted men—most of them members of the United Mine Workers—has made no move to attempt federal prosecution. Acting Attorney General Seymour and Assistant Attorney General Crim, the latter in charge of criminal prosecutions, said in Washington April 7 that the decision of the Supreme Court in the Coronado case appeared to prohibit the government from intervening. In the Coronado decision coal mining was held to be in no sense interstate commerce. It is believed at Washington that there can be no federal action in the Herrin case unless it can be shown that there was a direct effect upon interstate commerce.

In Illinois the state's attorney, in a statement following the trial, said that two juries in the two Herrin cases had returned verdicts of acquittal "regardless of evidence" and that "intimidation, prejudice or downright dishonesty actuated them."

Assistant Attorney General Middlekauff said further: "Under rulings of the trial court, when jurymen were being examined, any man who admitted he had an opinion as to whether the massacre of the disarmed and helpless strip miners was lawful was disqualified for jury service. In my opinion, this is not the law in Illinois. Every man in Williamson County has repeatedly heard or read the details of this horrible and revolting tragedy. If he has no opinion whether such killings were lawful or unlawful he is, in my judgment, wholly unfit for jury service. At this time it seems that further trials would be farcical."

The six men who were defendants in this trial were Hugh Willis, a district official of the United Mine Workers; James Fontanetta, Oscar Howard, James Brown, Otis Clark and Bert Grace. They were charged with the murder of Antonio Mulkavich, one of the armed guards who defended the strip mine during the two-days' siege preceding the slaughter. The jury was out six hours and fifty-five minutes. The jury was made up of seven farmers, one student, one union painter, one merchant and two union miners.

Pennsylvania Coal & Coke Corporation Buys Two Cambria County Mines

Stockholders of the Pennsylvania Coal & Coke Corporation, at a meeting held in Philadelphia April 5, ratified the proposal of the Board of Directors to purchase from the Clearfield Bituminous Coal Corporation the West Branch Colliery, located near Barnsboro, Cambria County, Pa., and the Victor No. 12 mine of the Carrolltown Coal Co., located at St. Benedict, Cambria County, Pa. The purchase of the West Branch Colliery carries with it the equipment and railroad sidings, about 400 vein acres of coal lands owned in fee and about 30 vein acres held under leasehold. In purchasing the Victor No. 12 mine the new owners take over the sidings, about 400 vein acres of coal lands owned in fee and approximately 870 vein acres held under lease.

The report of the corporation for the year ended Dec. 31, 1922, shows net income of $496,929 after expenses, depreciation and federal taxes, etc. This is equivalent to $4.04 a share ($50 par) earned on the $6,169,500 stock outstanding at the close of the year, as compared with $668,330, or $5.43 a share, in 1921.

Productive Activity Higher in February

Further figures on February production in the United States, according to the Survey of Current Business, reprinted from *Commerce Reports*, show that the January high level was well maintained and even slightly bettered when account is taken of the difference in working days in the two months. On this basis additional new high records were made in wool consumption and copper production. Orders continue in large volume in most lines, and the unfilled orders on hand for many commodities, such as steel sheets, steel barrels and flooring, were the largest recorded in recent years.

Prices received by farmers for crops and live stock again increased, while the cost-of-living figure was unchanged from January. Retail distribution continued at high levels, while savings deposits increased throughout the country.

The index of mineral production for February was 106.5 compared with 1919 as 100, declining from 124.3 in January, owing to the decreased output of bituminous coal. The index of marketings of animal products declined from 113.4 in January to 95.3 in February, while the crop marketing index declined from 114.5 to 73.4. The index numbers for both minerals and animal products were higher than a year ago, but crop marketings were the lowest recorded for February in recent years, due to the small marketings of cotton and tobacco.

Fireproof Anthracite Reaches Wisconsin

Reports from the East about "fireproof anthracite" are not empty jests to Wisconsin. A car of culm shipped to Moede & Son of Manitowoc, Wis.—and for which payment in advance by wire was demanded and made—has been tested by John C. White, state power plant engineer. Ash content of 51.72 was enough to carry the case before F. R. Wadleigh, Federal Fuel Distributor. Mr. White's report contained this: "Moisture, 1.54; volatile matter, 5.10; fixed carbon, 41.64; ash, 51.72; sulphur, not determined. The dry ash was 52.51 and the heat value was 5,800 B.t.u."

Bituminous Operators' Special Committee Files Brief Blaming Union for Shortage and High Prices

In response to a request by the U. S. Coal Commission for specific charges and evidence of violation of the rights of American citizens in the coal industry, the Bituminous Operators' Special Committee, of which J. C. Brydon is chairman, filed with the commission April 5 a brief which brands the policy of the United Mine Workers as the chief deterrent to satisfactory supply and price of coal. The brief charges the union with destructive monopoly of labor and outlines a campaign of allegedly deliberate violence which the committee asserts that the union fosters to maintain and extend its rule.

Colonel Henry L. Stimson and Goldthwaite H. Dorr, of counsel for the Bituminous Operators' Committee, prepared the brief. A letter from counsel accompanies it, asking an opportunity to present proof of its allegations "at such times and places as the commission may set."

"The close of the war," the brief states, "found this nation with abundant coal reserves which had been accumulated under the war powers of the government. The periods of shortage and consequent abnormal price which have since occurred can be directly traced to the action of this organization and its allies in railroad labor. Even the deficiencies of railroad service such as are occurring today can be largely attributed to the effect which nation-wide strikes have had in preventing regular production and throwing upon the railroads unnecessary and abnormal peak loads.

"But for the expectancy and almost certainty of a tie-up of whole coal fields about every so often, most of the speculation would be taken from the coal business; mines unfit to compete under normal conditions would not open as they do whenever a strike or threatened strike puts an unnatural bulge into the price of coal; the railroads would not be called upon to haul two months' coal in one, or to dilute their service among twice as many mines as are needed for normal year-round operations."

Twelve Cases of Violence Cited

Colorel Stimson and Mr. Dorr outline twelve cases of violence on a large scale in bituminous fields since Jan. 1, 1919, including Willis Branch and Mingo in West Virginia and Herrin in Illinois. They maintain the cases show "such uniform characteristics as to necessarily postulate a common purpose and creed as well as a uniform system of tactics."

"Acts of intimidation and violence to extend and preserve this monopoly of the United Mine Workers are not sporadic, but systematic," the brief declares. "Whenever it is endeavoring to organize a district they flame up from the fundamental determination of this organization and its members in authority that no one shall be permitted to mine coal in an organized district, or one under attack by the organization, without its leave. Equally systematic is the resistance to the efforts of the state to bring to justice the agents of this supergovernment."

The brief points out that there is no excuse for a labor monopoly as a protection for workers in the bituminous industry. "Bituminous coal mining," it says, "is one of the most bitterly competitive industries in the United States. Bituminous coal is mined in thirty states of the Union and is hardly more susceptible of monopolization than the land itself underneath which it is found. Enormous reserves of such coal, still untapped, underlie vast areas of our country, awaiting future development."

The Bituminous Committee, through its attorneys, seeks opportunity to prove before the Coal Commission that the principal cost of coal is labor; that wages in coal mining are double those in other industries because of the arbitrary power of the United Mine Workers of America; that "for collective bargaining this monopoly has substituted collective bludgeoning"; that the policy of the mine workers' organization "has laid the dead hand of monopoly on efficiency"; that the public pays the price for every unjust labor victory, and that further extension of the union would make government regulation hopeless.

In discussing the methods of the United Mine Workers the brief's first charge is:

"It supplants loyalty to the normal democratic machinery of government by loyalty to an irresponsible class-machine. (a) It creates a highly centralized organization in which a minority controls and overawes the majority by the weapons of incitement, abuse and intimidation. (b) It tends to crystallize and stratify the society of this republic into antagonistic classes. (c) It seeks to undermine the confidence of its members in the courts and other institutions of government."

In summing up their conclusions, Colonel Stimson and Mr. Dorr state: "We began our legal services in this matter in the hope that our work could be confined to the presentation of the results of economic investigation. The inquiry which we have thus far prosecuted has dispelled that hope. If an arrogant minority is challenging the American Republic by its attempt to fasten a monopoly of coal labor upon American industry and by its attempt to fasten an irresponsible class supergovernment upon American political institutions, purely economic questions sink into subordination.

"The effort to extort an artificial and economically unjustifiable wage scale by nation-wide strikes as the weapon is directed solely against the public. It is not organization against an employer; it is 'direct action' against the nation. It is the use of force for political ends.

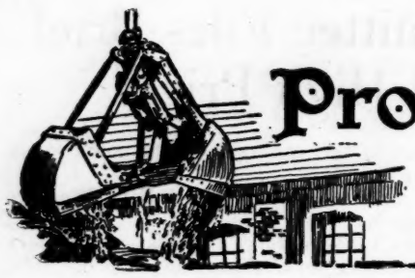
"The resort of such a monopoly to the weapon of calculated violence in carrying out its ultimate purpose is not accidental; it is inevitable. The use of the unlawful method is a necessary sequence of the conception of the unlawful purpose. The combination of such purpose and such methods is as abhorrent to the democratic institutions of a republic as would be the use of military force to establish a military dictatorship.

"We do not mean for an instant to be understood as attacking the rank and file of the United Mine Workers of America. They are men of much the same instincts and character as Americans the country over. Normally the chronic acts of violence, a few of which we have recited, would be as abhorrent to them as to us or as to this Commission. The worst wrong worked by the leaders of this monopolistic conspiracy has been to substitute for normal American standards a false loyalty to organization and class which has so perverted the normal instincts of normal men that Straitsville, Cliftonville and Herrin follow as the natural and inevitable consequences. These consequences will continue to follow until this monopoly is curbed."

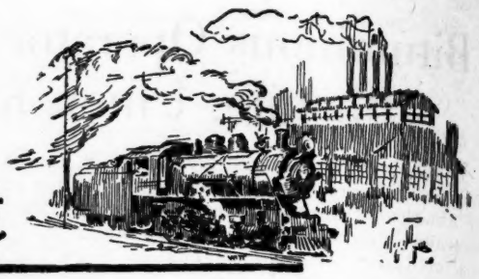
Operators' Charge Against Miners' Union Is "Fabrication of Lies," Says Murray

Officers of the United Mine Workers of America at International headquarters in Indianapolis have asserted that the bituminous operators' statement to the Coal Commission that the union carried on a campaign of violence to extend or preserve its hold on the mining industry is "untrue and unfounded." Union officials said they would seek an opportunity to disprove the operators' charges before the Coal Commission. Philip Murray, International vice president and acting head of the union while President John L. Lewis is absent in Europe, characterized the operators' statement as a "fabrication of lies," while William Green, International secretary-treasurer, merely said the allegations were untrue. The mine workers, he declared, do not have a monopoly on coal-mine labor in this country.

France handled the pick of the German army; it is much more difficult to handle the pick of the German miner. —*Woodstock* (Ont.) *Sentinel-Review.*



Production and the Market



Weekly Review

April is running true to form in the soft-coal market. Buying is very quiet and current output, which is holding up the late March figures, is being taken on current orders. With few exceptions large industrial buyers are not offering to contract, evidently waiting for prices to settle to the level at least of early 1922. The poorer grades of soft coal and steam sizes of anthracite are becoming increasingly difficult to move. Reports from Columbus are to the effect that some railroad contracts are being closed at from $2.25 to $2.50 for Ohio No. 8 mine-run. No-bills have been accumulating at small off-grade mines in central Pennsylvania for several weeks, and some of this coal has been and is being offered at $2, a figure below the cost of production. By comparison the better grades of steam coal are holding their own and some fair-sized blocks have been contracted above the current spot market.

Coal Age Index of spot prices of soft coal declined 19 points from last week and stood at 233 on April 9, the corresponding average price being $2.82, as compared with $3.05 the previous week. Prices on Indiana, southern Illinois, Pocahontas and western Kentucky coals held firm, but nearly all other coals on the list registered declines.

Production continued on an almost even rate with that of the past few weeks, approximating 10,500,000 tons. Preliminary estimates by the Geological Survey indicate that the total output of soft coal for the coal year ended March 31, 1923, was 419,710,000 net tons, a decrease of 3.5 per cent as compared with 434,754,000 net tons in the coal year ended March 31, 1922.

February Consumption Heavier than January

The government report of stocks of coal on hand on March 1 confirms earlier estimates that consumption in February was heavier than in January and that stocks declined in February. The report shows 36,000,000 tons of soft coal on hand, a decrease of 2,000,000 tons as compared with 38,000,000 tons on Feb. 1.

Illinois operators report market recovery from losses on account of no market, but in southern Ohio, Pittsburgh and central Pennsylvania car supply was not improved.

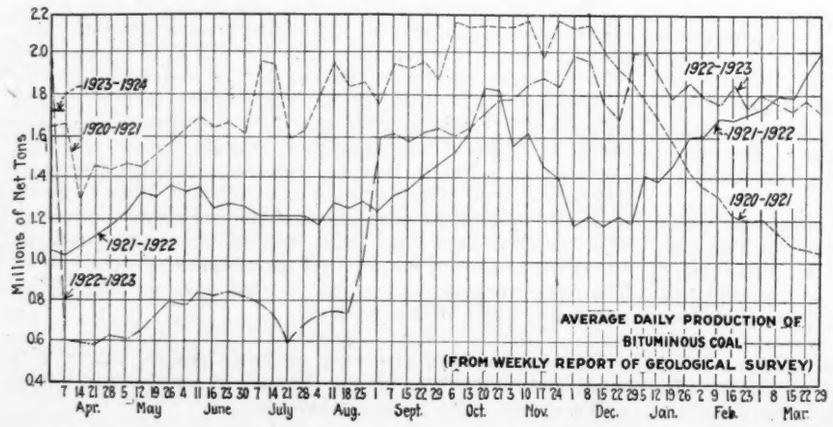
The short-lived strike in the British mines did not serve to increase the demand for coal for export. Inquiries were few and accumulations at Hampton Roads increased. Some exporters are optimistic, however, and look for heavier demand during the next few weeks. Dumpings at Hampton Roads for the week ended April 5 were 400,267 net tons, as compared with 370,823 net tons during the previous week.

Demand Good in Midwest

Considerable coal moved in the Midwest because of continued cool weather, demand around Chicago being heavy enough to absorb nearly all the coal produced, and there was some talk of car shortage not only in nearby fields but in the Eastern smokeless regions.

"The anticipated decrease in production on account of the pre-Easter holidays in the week ended March 31," says the Geological Survey, "did not occur and for the third successive week production was in the neighborhood of 10,400,000 tons. The present estimate of the total soft-coal output in the last week of March is 10,414,000 net tons, including coal shipped, mine fuel, local sales and coal coked, which is a decrease of only 10,000 tons from the revised estimate of the week preceding.

"Preliminary reports of cars loaded in the week April 2-7 showed 17,953 cars on Monday. Thus production on that day, which was a double holiday—Eight-Hour Day and Easter Monday—was equal to 45 per cent of the average for recent Mondays. Loadings on Tuesday were approximately 33,000 cars and did not show the usual recovery following holidays. The loadings during the



Estimates of Production

(Net Tons)

	1922	1923
BITUMINOUS		
March 17	10,843,000	10,428,000
March 24 (*b*)	11,448,000	10,424,000
March 31 (*a*)	10,469,000	10,414,000
Daily average	1,745,000	1,736,000
Coal year to date	434,754,000	419,710,000
Daily average coal year	1,416,000	1,366,000
ANTHRACITE		
March 17	1,907,000	2,057,000
March 24	2,095,000	2,126,000
March 31	1,896,000	2,008,000
Coal year to date	88,909,000	56,486,000
COKE		
March 24 (*b*)	175,000	384,000
March 31 (*a*)	191,000	388,000
Calendar year	1,809,000	4,709,000

(*a*) Subject to revision. (*b*) Revised from last report.

first four days of the week were 14 per cent less than in the week before, and the total output for the week will be around 9,500,000 tons."

Domestic sizes of anthracite moved rapidly. Demand is strong and the companies as well as the larger independent producers are in some instances booked heavily ahead. Independent egg, stove and chestnut coals are commanding premiums as high as $1.50 above company schedule. The steam sizes move slowly.

Midwest Moves Much Coal

Operations throughout Illinois and Indiana continued to ship domestic sizes in considerable volume during the past week, due to persistent cool weather. On the whole there was no trouble filling orders. Steam buyers sat back and took what screenings were produced. The expected increase in the price of steam sizes did not occur. Southern Illinois screenings still hang close to $2 though lower grades sell under the market, as always. This means that some screenings from Franklin County went as low as $1.75.

Car supply was ample for a full three days' running time through the southern Illinois fields. Many mines used all they got. But a number of big producers have been shut down, so that the capacity of the field is considerably reduced. In the Duquoin and Jackson County fields there was some activity but railroad tonnage was comparatively light all week and no mine worked over three days. The Security mine in this region, which has been down for about three weeks because of flooding, is about ready to operate again.

The Mt. Olive district remains in an unhappy state because the operators there are so badly undersold by southern Illinois independents and by entire neighboring districts. Mt. Olive producers are trying to get $3.25 for 3-in. lump while Franklin County 6-in. lump can be had for as low as $3. Central Illinois 6-in. lump goes for $2.65@$2.75.

St. Louis Business Is Fair

Seasonable weather keeps domestic coal moving in small quantities in St. Louis and in good demand for the cheaper grades. The dealers are fortunate this year in being able to clean up all of their old stocks. The April retail prices which went into effect of $5.50 on Standard, $6.25@$6.50 on Mt. Olive and $7.50@$7.75 on Carterville have kept the dealers fairly active. Anthracite came down from $16.25 for all sizes to $15.75 for the large sizes and $16 for the

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

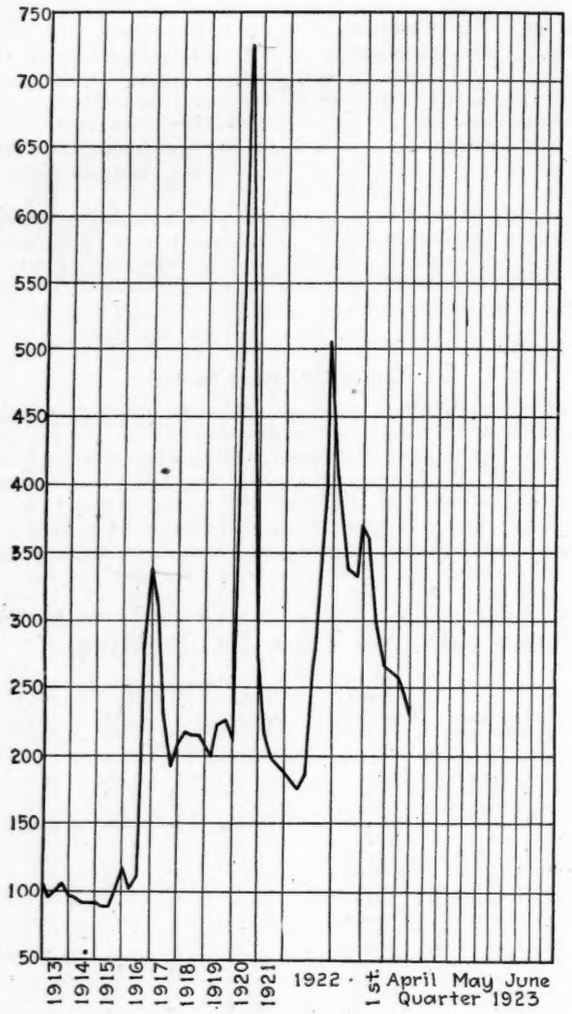
Low-Volatile, Eastern	Market Quoted	Apr. 10 1922	Mar. 26 1923	Apr. 2 1923	Apr. 9 1923†
Smokeless lump	Columbus	$2.85	$7.00	$6.85	*$6.00@$6.50*
Smokeless mine run	Columbus	2.15	4.50	4.25	4.00@ 4.50
Smokeless screenings	Columbus	1.35	4.50	4.25	*3.50@ 4.00*
Smokeless lump	Chicago	2.40	6.35	6.10	6.00@ 6.25
Smokeless mine run	Chicago	1.75	4.00	3.75	3.50@ 4.00
Smokeless lump	Cincinnati	2.50	6.75	6.25	*6.00*
Smokeless mine run	Cincinnati	1.90	4.60	4.00	*3.75@ 4.00*
Smokeless screenings	Cincinnati	1.65	4.50	3.85	3.75@ 4.00
*Smokeless mine run	Boston	4.60	6.50	6.10	**6.00@ 6.50**
Clearfield mine run	Boston	2.05	2.60	3.05	*2.35@ 3.50*
Cambria mine run	Boston	2.30	3.60	3.85	*3.25@ 4.25*
Somerset mine run	Boston	2.10	3.10	3.50	*3.00@ 3.75*
Pool 1 (Navy Standard)	New York	2.80	4.25	4.10	*3.50@ 4.50*
Pool 1 (Navy Standard)	Philadelphia	2.80	4.50	4.30	*3.90@ 4.30*
Pool 1 (Navy Standard)	Baltimore	2.70	.....	.....	.....
Pool 9 (Super. Low Vol.)	New York	2.40	3.50	3.50	*3.00@ 3.75*
Pool 9 (Super. Low Vol.)	Philadelphia	2.30	3.70	3.50	*3.00@ 3.65*
Pool 9 (Super. Low Vol.)	Baltimore	2.50	.....	3.50	*3.25*
Pool 10 (H.Gr.Low Vol.)	New York	1.95	3.00	2.90	*2.50@ 3.25*
Pool 10 (H.Gr.Low Vol.)	Philadelphia	2.00	3.20	3.00	*2.60@ 3.00*
Pool 10 (H.Gr.Low Vol.)	Baltimore	2.25	.....	3.25	*2.90*
Pool 11 (Low Vol.)	New York	1.75	2.50	2.50	2.25@ 2.75
Pool 11 (Low Vol.)	Philadelphia	1.75	2.60	2.50	*2.20@ 2.60*
Pool 11 (Low Vol.)	Baltimore	2.15	.....	2.35	*2.25*
High-Volatile, Eastern					
Pool 54-64 (Gas and St.)	New York	1.70	2.35	2.40	*2.10@ 2.50*
Pool 54-64 (Gas and St.)	Philadelphia	1.55	2.35	2.30	.....
Pool 54-64 (Gas and St.)	Baltimore	1.70	.....	2.40	*2.25*
Pittsburgh sc'd gas	Pittsburgh	.....	3.60	3.35	*3.00*
Pittsburgh mine run (St.)	Pittsburgh	.....	2.35	2.00	2.00
Pittsburgh slack (Gas)	Pittsburgh	.....	2.50	2.25	*2.00*
Kanawha lump	Columbus	2.35	4.50	4.25	*3.75@ 4.25*
Kanawha mine run	Columbus	1.55	2.75	2.75	*2.25@ 2.75*
Kanawha screenings	Columbus	1.45	2.40	2.30	**2.15@ 2.60**
W. Va. lump	Cincinnati	2.00	3.60	3.50	**3.25@ 4.00**
W. Va. Gas mine run	Cincinnati	1.75	2.75	2.75	*2.50@ 2.75*
W. Va. Steam mine run	Cincinnati	1.55	2.75	2.50	*2.25@ 2.50*
W. Va. screenings	Cincinnati	1.40	2.35	2.10	**2.25@ 2.50**
Hocking lump	Columbus	.....	3.75	3.50	*2.75@ 3.25*
Hocking mine run	Columbus	.....	2.45	2.35	*2.00@ 2.25*
Hocking screenings	Columbus	.....	2.05	1.90	*1.65@ 1.85*
Pitts. No. 8 lump	Cleveland	2.60	3.10	2.90	2.50@ 3.35
Pitts. No. 8 mine run	Cleve'and	$1.80	$2.35	$2.25	*2.15@ 2.30*
Pitts. No. 8 screenings	Cleveland	1.85	2.10	2.00	*1.90@ 2.10*
Midwest					
Franklin, Ill. lump	Chicago	3.45	3.85	3.85	3.85
Franklin, Ill. mine run	Chicago	2.75	3.10	3.10	3.00@ 3.25
Franklin, Ill. screenings	Chicago	2.65	2.05	2.05	1.90@ 2.25
Central, Ill. lump	Chicago	2.60	3.10	3.10	*2.65@ 2.90*
Central, Ill. mine run	Chicago	2.60	2.60	2.60	*2.00@ 2.25*
Central, Ill. screenings	Chicago	1.85	1.60	1.60	1.50@ 1.75
Ind. 4th Vein lump	Chicago	3.15	3.60	3.35	3.25@ 3.50
Ind. 4th Vein mine run	Chicago	2.45	2.85	2.85	2.75@ 3.00
Ind. 4th Vein screenings	Chicago	2.00	1.85	1.85	1.75@ 2.00
Ind. 5th Vein lump	Chicago	2.60	3.10	2.85	2.75@ 3.00
Ind. 5th Vein mine run	Chicago	2.60	2.10	2.10	2.00@ 2.25
Ind. 5th Vein screenings	Chicago	2.20	1.60	1.55	1.50@ 1.60
Standard lump	St. Louis	2.65	2.60	2.60	*2.50*
Standard mine run	St. Louis	1.90	2.10	2.10	*1.75@ 2.00*
Standard screenings	St. Louis	1.70	.95	.95	**1.10**
West Ky. lump	Louisville	2.45	2.50	2.50	2.25@ 2.75
West Ky. mine run	Louisville	1.90	2.05	1.85	1.75@ 2.00
West Ky. screenings	Louisville	1.90	1.70	1.75	1.60@ 1.90
West Ky. lump	Chicago	.....	2.85	2.85	2.75@ 3.00
West Ky. mine run	Chicago	.....	1.80	1.80	1.75@ 1.85
South and Southwest					
Big Seam lump	Birmingham	2.00	2.50	2.50	2.50
Big Seam mine run	Birmingham	1.70	2.10	2.10	2.00@ 2.25
Big Seam (washed)	Birmingham	1.85	2.35	2.35	2.25@ 2.50
S. E. Ky. lump	Chicago	.....	3.75	3.85	3.75@ 4.00
S. E. Ky. mine run	Chicago	.....	2.85	2.85	2.75@ 3.00
S. E. Ky. lump	Louisville	2.25	4.00	4.25	*3.75@ 4.25*
S. E. Ky. mine run	Louisville	1.70	2.85	2.85	*2.40@ 3.25*
S. E. Ky. screenings	Louisville	1.50	2.25	2.40	**2.25@ 2.75**
S. E. Ky. lump	Cincinnati	1.90	3.50	3.75	*3.00@ 4.00*
S. E. Ky. mine run	Cincinnati	1.60	2.50	2.60	*2.25@ 2.75*
S. E. Ky. screenings	Cincinnati	1.45	2.25	2.10	**2.25@ 2.50**
Kansas lump	Kansas City	4.25	4.50	4.50	*3.25@ 4.50*
Kansas mine run	Kansas City	4.00	3.50	3.50	*3.00@ 3.50*
Kansas screenings	Kansas City	2.50	2.60	2.60	2.50@ 2.75

* Gross tons, f.o.b. vessel, Hampton Roads.
† Advances over previous week shown in **heavy type**, declines in *italics*.

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

	Market Quoted	Freight Rates	Latest Pre-Strike Independent	Latest Pre-Strike Company	April 2, 1923 Independent	April 2, 1923 Company	April 9, 1923† Independent	April 9, 1923† Company
Broken	New York	$2.34	.....	$7.60@$7.75	$9.00	$7.75@$8.35	.....	$7.75@$8.35
Broken	Philadelphia	2.39	$7.00@$7.50	7.75@ 7.85	.....	7.90@ 8.10	.....	7.90@ 8.10
Egg	New York	2.34	7.60@ 7.75	7.60@ 7.85	8.25@10.00	8.00@ 8.35	8.25@10.00	8.00@ 8.35
Egg	Philadelphia	2.39	7.25@ 7.75	7.75	9.25@11.00	8.10@ 8.35	*9.25@ 9.50*	8.10@ 8.35
Egg	Chicago*	5.09	7.50	8.25	12.00@12.50	7.20@ 8.25	12.00@12.50	7.20@ 8.25
Stove	New York	2.34	7.90@ 8.20	7.90@ 8.10	8.25@10.00	8.00@ 8.35	8.25@10.00	8.00@ 8.35
Stove	Philadelphia	2.39	7.85@ 8.10	8.05@ 8.25	9.25@11.00	8.15@ 8.35	*9.25@ 9.50*	8.15@ 8.35
Stove	Chicago*	5.09	7.75	8.25	12.00@12.50	7.35@ 8.25	12.00@12.50	7.35@ 8.25
Chestnut	New York	2.34	7.90@ 8.20	7.90@ 8.20	8.25@10.00	8.00@ 8.35	8.25@10.00	8.00@ 8.35
Chestnut	Philadelphia	2.39	7.85@ 8.10	8.05@ 8.15	9.25@11.00	8.15@ 8.35	*9.25@ 9.50*	8.15@ 8.35
Chestnut	Chicago*	5.09	7.75	8.25	12.00@12.50	7.35@ 8.35	12.00@12.50	7.35@ 8.35
Range	New York	2.34	.....	.....	.....	8.30	.....	8.30
Pea	New York	2.22	5.00@ 5.75	5.75@ 6.45	6.30@ 8.50	6.00@ 6.30	*6.30@ 7.50*	6.00@ 6.30
Pea	Philadelphia	2.14	5.50@ 6.00	6.10@ 6.25	7.00@ 9.00	6.15@ 6.20	*7.00@ 7.25*	6.15@ 6.20
Pea	Chicago*	4.79	6.00	6.25	7.00@ 8.00	5.49@ 6.03	7.00@ 8.00	5.49@ 6.03
Buckwheat No. 1	New York	2.22	2.75@ 3.00	3.50	3.00@ 4.00	3.50@ 4.15	*2.50@ 3.25*	3.50@ 4.15
Buckwheat No. 1	Philadelphia	2.14	2.75@ 3.25	3.50	4.00@ 5.00	4.00	*3.50*	*3.50*
Rice	New York	2.22	2.00@ 2.50	2.50	2.25@ 2.75	2.50	*2.00@ 2.50*	2.50
Rice	Philadelphia	2.14	2.00@ 2.50	2.50	3.75@ 3.00	2.75@ 3.00	*2.50*	*2.50*
Barley	New York	2.22	1.50@ 1.85	1.50	1 25@ 1.75	1.50	*1.25@ 1.50*	1.50
Barley	Philadelphia	2.14	1.50@ 1.75	1.50	1.40@ 2.00	2.00	*1.50*	*1.50*
Birdseye	New York	2.22	.....	2.00@ 2.50	.....	1.60	.....	1.60

* Net tons, f.o.b. mines. † Advances over previous week shown in **heavy type**, declines in *italics*.



Coal Age Index 233, Week of April 9, 1923. Average spot price for same period $2.82. This diagram shows the relative, not the actual prices on fourteen coals, representative of nearly 90 per cent of the bituminous output of the United States weighted first with respect to the proportions each of slack, prepared and run-of-mine normally shipped, and second, with respect to the tonnage of each normally produced. The average thus obtained was compared with the average for the twelve months ended June, 1914, as 100, after the manner adopted in the report on "Prices of Coal and Coke, 1913, 1918," published by the Geological Survey and the war Industries Board.

small sizes, while byproduct coke is $11 and gas-house $10.50, with smokeless egg and lump at $12.50.

Strike Concentrates Kentucky Business

The strike in the southern section of western Kentucky, which affects about one-third of the field is resulting in better demand and car supply for the balance of the field. It is reported that the operating sections of the field got 100 per cent car supply during the week. The strike has not forced prices higher. Demand hasn't been sufficient for that. Mines have not been able to run much better than two to three days a week in spite of the plenitude of cars.

Prices as a whole are quite steady. There is a firmer market on screenings, and this market is likely to show advance. Lack of prepared-coal orders is resulting in much slower running on screened coal, with the result that screenings are getting scarcer and prices firmer. While some screenings have been sold as low as $1.50 a ton in past weeks, with the general market at from $1.60 to $1.75 or $1.85, it is reported that most of the screenings last week were quoted at around $1.85@$1.90 on actual sales.

Louisville feels that the general outlook for coal business during the summer is fair in spite of the fact that high ocean rates and combinations among Easterners to boost prices have driven a good deal of foreign trade away and stopped the flow of coal that had started toward the Atlantic piers. Lake trade is expected to be slow in opening but industrial demand generally is counted on to assume large proportions. Country-wide stocking on a bigger scale than usual is expected.

Northwest Expects Lake Trade to Lag

Up around the Head-of-the-Lakes it is generally agreed now that the Lake season will not open on April 20, as prophesied. The date is now set forward to about May 1 because a good deal of heavy ice still locks the harbors and passages and the weather is still distinctly cold.

There is no anthracite at Duluth and Superior. Householders with magazine stoves which will burn only hard coal and whose coal bins are empty are so thoroughly up against it that the Mayor of Superior asked those in the city who had coal to divide it.

In spite of this scramble for hard coal and in spite of the fact that there remain but 400,000 tons of free bituminous on the docks to last until coal arrives by vessel, there is little market for the bituminous.

Milwaukee is little worried just now. Enough hard coal is in hand for the demand and bituminous is arriving steadily. The only real difficulty is a congestion of terminals which is expected to be cleared soon. Given a spell of fair weather, the car ferries are counted on to move a good deal of coal across the lake from Ludington, Mich. Some consignments from Toledo are still undelivered though they have been three weeks on the way. Rail anthracite has been arriving through Chicago.

Western Trade Softens

April 1 in the Kansas City region brought the usual scramble to unload domestic sizes on hand at once. In such a time quotations show wide spreads, coal bringing what it will. Kansas lump and nut sell all the way from $4.50 down to $3.25.

Domestic coal in Colorado is moving fairly well, with mines running an average of 64 per cent of the time, but steam sizes drag. The state produced 1,909,000 tons of coal during January and February and is now running better than 100,000 tons a week.

In Utah most mines are getting only two days a week. Soft weather and an anticipated drop in price have held the market flat. Carbon County lump sells for $4.50@$5; egg, $3.50@$4, and slack, $1.25. Contracting is dull. Metals are on the upgrade however, improving the market for coke. The Utah Fuel Co. made 21,000 tons in March selling for $8.50 at the ovens. Car supply is ample and there are no labor disturbances in the state.

Lull in the Cincinnati Market

Buyers and sellers in the Cincinnati market are marking time. Lake buyers are out bargain hunting and although the Coal & Ore Exchange permits will not be issued until April 15 at the earliest, they have been picking up what spot tonnage they can around $3.25@$3.50, figuring to pay demurrage and still get coal at a lower price than the $4 which most shippers are holding out for. The shut down of the Kanawha mines that refused to accept the wage scale of the Miners' union had but little effect on this market.

Softness is developing in the Columbus market and it is believed it will continue until the lake season is well under way.

The Cleveland market was quiet. Not much contracting is being done because operators are not disposed to sell ahead at current quotations.

The Pittsburgh market turned still softer during the week. There was some buying of lake coal, but only in odd lots.

No improvement was noted in the Buffalo market. Buying was slow, and it looked as if consumers were determined to hold off for some time to come.

Dullness Pervades New England Market

There are few bright spots in the current market in New England. There are only scattering purchases and those mostly on the part of small users. Many of the larger buyers are postponing action until prices are more nearly on last year's level. There seems no anxiety whatever over the future and the agencies find it difficult to place tonnage

more than a few weeks in advance. Practically all quotations are at a lower point than a fortnight ago, and with many operators it is a question whether they would not be better off to close mines for the present, especially in high-cost sections in central Pennsylvania. The prospect is for continuing dullness through April and May, and only by constant effort will shippers be able to place any considerable output.

Accumulations at Hampton Roads have mounted steadily since March 15. Upward of 300,000 tons was on cars early the past week at Norfolk and Newport News, the larger proportion of it being navy standard coal. New England industries are only mildly interested in contract quotas, and there is a general slackness that used to be considered characteristic of July and August.

Quotations on cars at Boston, Providence and Portland are at least 50c. off from a week ago. Pocahontas and New River that were then selling at $9.25 per gross ton are now an easy buy at $8.75, a price that coincides with the April contract basis named by one of the large producers. While there still are delays in handling cargoes at this end the congestion is less evere, but there is still enough detention to make coal factors chary of sending cargoes forward unsold at their own risk.

Throughout the central Pennsylvania districts there is urgent need of orders. This territory is being thoroughly canvassed, but softening prices on the smokeless coals from Hampton Roads make the area open to the all-rail route more and more circumscribed. Ordinary Clearfields of moderate preparation have sold recently at prices well down to the $2.25 mark, although certain specialties of most approved grade have commanded $3.50@$3.75, and even $4.

New York Looks for Brisk Summer

Buyers in the New York market continue to mark time. There was practically no demand but there was a better feeling due to increased inquiries. A brisk summer is looked for beginning with the opening of the lake season. Buyers are taking coal in small quantities.

The Philadelphia market was slow. A survey shows that outside of the big utilities, stocks above ground are moderate and consumers show little inclination to add to them. The local tide business while a trifle better has not at any time recently been sufficient to stimulate domestic demand.

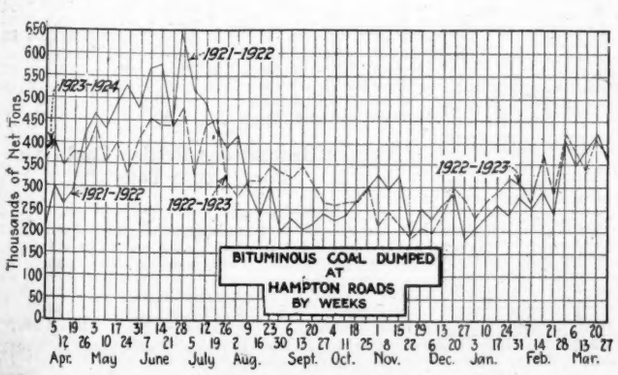
Export Market Growing at Baltimore

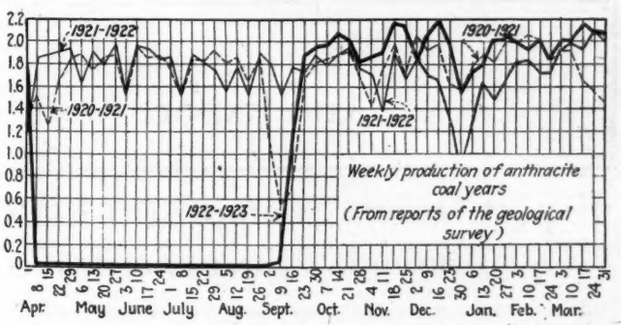
The continued growth of the export market is one of the outstanding features at Baltimore. Some congestion is already noted at terminals where supply is running in excess of demand. Revised figures show that for the first three months of this year 109,688 tons of cargo coal was shipped from Baltimore in 23 vessels. The total dumpings at Baltimore for the year 1922 were 107,735 tons.

Anthracite Output Holds Up Despite Holidays

Producers are having no trouble to move their domestic coals. The steam coals are accumulating however, and independent operators and shippers are disposed to sell below company quotations.

Retail dealers are ready to take all the larger coals they can obtain and are making deliveries to consumers as rapidly as possible.





"Contrary to expectations, production of anthracite in the week ended March 31," says the Geological Survey, "was not seriously curtailed by observance of Easter holidays. Daily reports of cars loaded, furnished by the American Railway Association, indicate that production on Good Friday amounted to 65 per cent of the output on other recent Fridays and production on Saturday compared favorably with preceding Saturdays. The total production for the week is estimated, on the basis of 38,397 cars loaded, at 2,008,000 net tons, including mine fuel, local sales and dredge and washery output.

"Early returns for the week April 2-7 indicate a general observance of Eight-Hour Day, April 2, as a holiday, and little if any anthracite was produced. Production was approximately 70 per cent of normal on Tuesday and further, but not full, recovery was made by Wednesday. In view of the uncertainty as to the rate of production maintained in the second half of the week it is impossible to fore-

Coke Production Increases Slightly

Production of coke during the week ended March 31, estimated by the Geological Survey from reports of cars loaded by the principal coke carriers and in part from reports of producers was 388,000 net tons, as compared with 384,000 tons during the previous week.

How the Coal Fields Are Working

Percentages of full-time operation of bituminous coal mines, by fields, as reported by the U. S. Geological Survey in Table V of the Weekly Report.

	Jan. 1 to Apr. 1, 1922 Inclusive	Sept. 5 to Dec. 30, 1922 Inclusive	Jan. 1 to Mar. 24, 1923 Inclusive	Week Ended Mar. 24 1923
U. S. Total	55.7	....	....	....
Alabama	64.6	84.7	89.0	(a)
Somerset County	74.9	36.3	27.4	22.5
Panhandle, W. Va.	51.3	57.3	55.4	58.2
Westmoreland	58.8	65.8	54.1	60.0
Virginia	59.9	55.7	54.2	61.5
Harlan	54.8	22.1	22.2	28.2
Hazard	58.4	16.4	20.1	28.6
Pocahontas	60.0	36.6	37.8	38.3
Tug River	63.7	28.8	34.2	35.2
Logan	61.1	26.2	30.8	30.8
Cumberland-Piedmont	50.6	31.7	46.3	51.5
Winding Gulf	64.3	30.4	33.7	36.4
Kenova-Thacker	54.3	42.4	32.1	45.0
N. E. Kentucky	47.7	28.4	28.2	(a)
New River	37.9	31.6	35.0	36.7
Oklahoma	59.6	59.1	43.7	58.1
Iowa	78.4	75.9	79.0	69.2
Ohio, Eastern	46.6	40.8	34.4	37.9
Missouri	66.8	76.3	77.4	88.3
Illinois	54.5	49.9	48.9	39.7
Kansas	54.9	55.9	46.9	48.3
Indiana	53.8	37.7	53.3	47.4
Pittsburgh†	39.8	41.2	32.8	35.3
Central Pennsylvania	50.2	53.4	45.7	54.9
Fairmont	44.0	35.5	36.1	33.0
Western Kentucky	37.7	32.4	32.8	26.1
Pittsburgh*	31.9	56.1	60.4	46.0
Kanawha	13.0	15.6	22.3	22.4
Ohio, Southern	24.3	38.1	32.7	30.7

* Rail and river mines combined.
† Rail mines.
(a) No report.

Car Loadings, Surplusages and Shortages

	Cars Loaded All Cars	Cars Loaded Coal Cars
Week ended March 24, 1923	917,036	185,062
Previous week	904,286	183,530
Same week in 1922	837,241	203,219

	Surplus Cars All Cars	Surplus Cars Coal Cars	Car Shortage	
March 21, 1923	12,741	4,111	75,993	29,915
March 14, 1923	12,461	3,897	74,442	30,405
Same date in 1922	219,483	85,764	.....	.....

Foreign Market And Export News

Export Orders Swamp British Mine Owners; Rhonnda Miners Settle Trouble

British mines continued their heavy production during the week ended March 24, when 5,703,000 tons of coal were mined. This was but 18,000 tons below the previous week's record, which was the highest for any week of the present year, and but 39,000 tons less than the record for 1922, 5,742,000 tons having been the output for the week of Dec. 26.

It was reported that the strike of the miners in the Rhonnda coal fields had been settled and that the men would return to the mines on April 10.

Fully 100 vessels were said to be in the Welsh ports awaiting their turn to be loaded.

Chief pressure on the Welsh market comes from France, Italy and Germany. From these sources buyers appear anxious to cover themselves right up to the winter, and well over 250,000 tons has been sold to Germany.

In addition to the inquiries from France, Italy, Germany, and elsewhere, Russia is reported in the market for heavy quantities to be delivered over the coming Baltic season.

All mines are sold up to the end of March, and have little to offer for April, while buyers are anxious to purchase for at least six months ahead.

The French demand is easier, in some cases to the extent of withdrawing inquiries already in hand. Germany will need coal supplies for some time to come, but is at the moment awaiting developments. Belgium is less eager in her inquiries. American coal is offering freely, so that buyers feel fairly safe in holding off.

Orders Flood French Collieries

Collieries of the Nord and Pas-de-Calais are flooded with orders far exceeding their production, many from consumers who are trying to avoid paying the high prices quoted for British coals. Importation of Dutch coals is increasing, while Belgian coal imports show a tendency to decrease. In February, France imported 43,000 tons of raw coal from Holland.

A meeting was recently held in Paris between representatives of French and Belgian collieries with a view of coming to an agreement on prices to be charged for domestic coals supplied to the Paris market during the coming summer, but no agreement was reached at that time owing to French collieries quoting prices considered by the Belgians as too low.

Hampton Roads Export Demand Good

Business at Hampton Roads slackened slightly last week although the general trend was upward and coal movement continued on a par with March business, when records for twelve months were broken. Export business held up well, with further prospects of this business to stimulate the market.

Prices fell slightly, and whatever dullness was apparent was attributed to this. Coastwise business was down, somewhat, though bunkers held good. Prospect of shipments to England, in case labor difficulties there should prove serious, gave stimulus to the market.

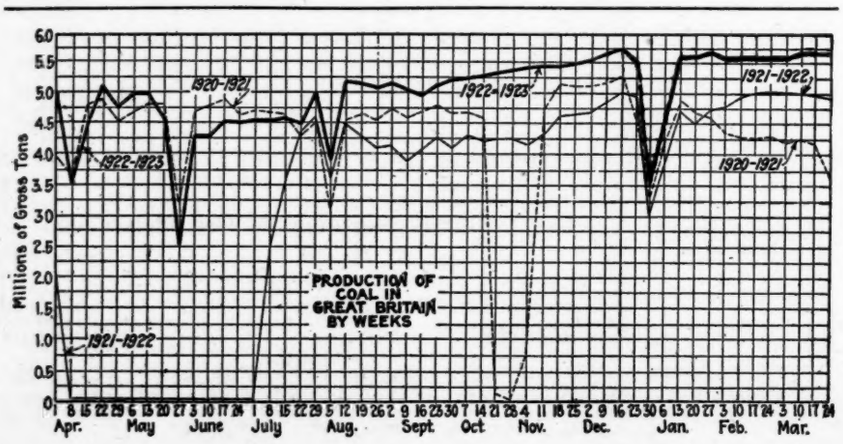
Unusually large supplies of coal were on hand at the piers, and the car situation showed further improvement. Domestic business fell in the wake of spring, and many retail dealers were preparing to devote their energies to the other side of their business, that of distributing ice.

Holland's Coal Production

Although the production of bituminous coal in the Province of Limburg, Holland, 1922 was nearly 600,000 tons greater than in 1921, Holland is still largely dependent upon foreign coals. In 1922 there were produced in the Province of Limburg 4,500,000 tons of bituminous coal, as compared with 3,920,000 tons in 1921 and 3,940,000 tons in 1920.

There were imported into Holland in 1922 6,220,000 tons of coal and 234,000 tons of coke, as compared with 4,890,000 tons of coal and 200,400 tons of coke in 1921. Of the coal imported in 1922 4,530,000 tons came from Great Britain and 1,190,000 tons from Germany. In the previous year 1,770,000 tons came from Great Britain and 1,280,000 tons from Germany.

In 1922 there were exported 2,260,000 tons of coal and 350,000 tons of coke, as compared with 1,930,000 tons of coal and 120,400 tons of coke in the previous year. Of the exports in 1922 Germany received 354,000 tons, Belgium 549,000 tons and France 249,600 tons.



Export Clearances, Week Ended March 31, 1923

FROM HAMPTON ROADS

	Tons
For Africa:	
Br. SS General Church, for Algeria	9,019
For Brazil:	
Br. SS Norman Monarch, for Rio de Janeiro	6,579
For Cuba:	
Nor. SS Karmoy, for Havana	3,660
Du. SS Trompenberg, for Havana	2,727
Nor. SS Gunnar Heiberg, for Havana	3,800
For Germany:	
Du. SS Maasburg, for Emden	10,042
For Greece:	
Ital. SS Timavo, for Piraeus	9,189
For West Indies:	
Nor. SS Sorland, for Guayabal	1,478

FROM PHILADELPHIA

For France:	
Br. SS Tafna, for Dunkirk	....
Jap. SS. Tne Maru, for Dunkirk	....

United States December Coal Imports

(In Gross Tons)

	Dec., 1921	Dec., 19 22
Coal and coke:		
Anthracite	183	26,070
Bituminous	87,506	201,936
Imported from:		
United Kingdom	17,031	188,355
Canada	66,520	154,569
Japan	600	.....
Australia	2,614	13,466
Other countries	741	112
Coke	3,165	9,125

Hampton Roads Pier Situation

	Mar. 29	April 5
N. & W. piers, Lamberts Pt.:		
Cars on hand	2,060	2,074
Tons on hand	124,951	133,348
Tons dumped for week	112,369	123,401
Tonnage waiting	9,000	18,150
Virginian Ry. piers, Sewalls Pt.:		
Cars on hand	1,614	1,145
Tons on hand	90,880	63,367
Tons dumped for week	134,836	153,255
Tonnage waiting	12.000	1,261
C. & O. piers, Newport News:		
Cars on hand	2,220	2,915
Tons on hand	118,465	152,735
Tons dumped for week	83,887	80,726
Tonnage waiting	3,900	1,605

Pier and Bunker Prices, Gross Tons

PIERS

	March 31	April 7†
Pool 9, New York	$6.50@$7.00	*$6.20@$6.75*
Pool 10, New York	5.60@ 6.15	*5.50@ 6.00*
Pool 11, New York	4.75@ 5.25	**4.75@ 5.50**
Pool 9, Philadelphia	6.70@ 7.00	*6.45@ 6.90*
Pool 10, Philadelphia	5.70@ 6.30	*5.55@ 6.00*
Pool 11, Philadelphia	4.60@ 5.40	*4.60@ 5.00*
Pool 1, Hamp. Roads	6.40@ 6.50	*6.25*
Pools 5-6-7 Hamp. Rds.	5.75	*5.70*
Pool 2, Hamp. Roads	6.40@ 6.50	*6.25*

BUNKERS

Pool 9, New York	6.80@ 7.30	*6.50@ 7.05*
Pool 10, New York	5.90@ 6.45	*5.80@ 6.30*
Pool 11, New York	5.05@ 5.55	**5.05@ 5.80**
Pool 9, Philadelphia	6.90@ 7.20	*6.75@ 7.00*
Pool 10, Philadelphia	6.00@ 6.50	*5.80@ 6.35*
Pool 11, Philadelphia	4.90@ 5.75	*4.85@ 5.30*
Pool 1, Hamp. Roads	6.50	*6.35*
Pool 2, Hamp. Roads	6.50	*6.35*

Current Quotations British Coal f.o.b. Port, Gross Tons

Quotations, by Cable to *Coal Age*

	March 31	April 7†
Admiralty, large	37s.6d @40s.	37s.6d.@40s.
Steam, smalls	28s.@30s.	**30s.**
Newcastle:		
Best steams	34s.6d.@35s.	**35s.**
Best gas	34s.@35s.	**35s.**
Best bunkers	32s.6d.@35s.	**32s.@36s.**

† Advances over previous week shown in **heavy** type; declines in *italics*.

News Items From Field and Trade

ILLINOIS

The recent **refusal of the Interstate Commerce Commission to grant permission for the construction of the Jefferson & Southwestern R.R.**, has somewhat upset the plans for the new mine at the new townsite of Nason by the Illinois Coal Corporation. The road was to be used for the heavy haulage of material, etc., during the developing and construction of the mine. An appeal has been taken on the decision and if the outcome is still unsuccessful, the next step may be to build an extension spur from the nearest point of the Chicago & Eastern Illinois R.R. near Ina, or from the Chicago, Burlington & Quincy R.R. at Waltonville, to the mine site.

A. H. Vogt assumed office on April 2 as treasurer of the Illinois Coal Corporation, to which he was elected recently. For six years Mr. Vogt was comptroller of accounts of the Federal Reserve Bank of Chicago, in which capacity he devised a system of accounting for the United States Government fiscal agency operations of the bank which was adopted by several other Federal Reserve banks. Mr. Vogt also has been a member of the Federal Reserve committee on economy and efficiency for some time.

Proposals for furnishing fuel for the use of army stations in miscellaneous amounts between April 20, 1923, and March 31, 1924, will be opened April 12 by the Quartermaster Supply Officer, Chicago General Intermediate Depot.

The M. & B. Coal Co., Danville, has been incorporated with a capital of $25,000, incorporators, L. T. Mauck, Wm. Mauck, Louis Bock, Louis F. Bock, Paul F. Bock. Correspondent, Louis Clement, 1102 First National Bank Building, Danville.

C. W. Smith, of Chicago, chief engineer of the **Illinois Coal Corporation,** has arrived at Mt. Vernon, Jefferson County, to take active charge of the sinking of the company's new mine near there. The company also plans to **establish the town of Nason,** near the mine site, the town being named after A. J. Nason, head of the coal company. Engineer Smith has stated that all preliminary work and details are complete and that **actual sinking will be started soon.** It also is estimated that six months will be required to sink the two shafts to the coal.

The Free Belle Mining Co., Freeburg; capital, $50,000; has been incorporated by H. F. Driemeyer, O. E. Altrogge and S. J. Fowler. The company will mine and deal in coal, coal products and minerals. Correspondents, Pope & Driemeyer, 24 N. Main Street, East St. Louis.

The Valley View Mine, at Coal Valley, **has been closed for a few months.** The mine is owned by Sachville & Wynn. The shaft will be closed the greater portion of the spring and summer months and during that time, improvements of various nature will be made in and around the plant.

Mine No. 2, better known as the **Hart-Williams mine,** at Benton and owned by the **Chicago, Wilmington & Franklin Coal Co., has suspended** operations for six weeks or longer. This is the first colliery of that company to be closed this spring, and the fourth large mine in Franklin County to shut down. The Hart-Williams mine employed over 500 men.

J. C. Micheals, president of the Chest Creek Coal Co., of Chicago, has been found guilty in federal District Court of trying to defraud several railroads by claiming losses in shipment which did not occur. He has not yet been sentenced but the maximum penalty for the offence is 20 years in prison or $50,000 fine or both. The Chest Creek Coal Co. has been heavily involved in Chicago graft scandals, charged with shortweighing the school department.

A. K. Mordue has left the C. M. Moderwell organization in Chicago and joins the **Southern Coal, Coke & Mining Co.,** whose Chicago office has been moved into the Peoples' Gas Building. **W. K. Kavanaugh,** president of this company, has returned to St Louis from a long trip through the West Indies and Central America.

The Glenn Coal Co., Astoria, has been chartered with a capital of $12,000 to mine and deal in coal. Incorporators: E. G. Bader, M. W. Hughes, David E. Thomas.

The Utilities Coal Co., 332 South Michigan Avenue, Chicago, has been incorporated with a capital stock of $200,000. Incorporators are Cyrus H. Adams, Jr., Ben H. Matthews, Edward M. Bullard. The company will mine and deal in fuel.

INDIANA

The Clinton Coal Co., of Clinton, has contracted with the Roberts & Schaefer Co. for the complete installation of a new steel tipple at Clinton. This tipple is to replace the present wood structure and will be equipped with combination installation of Marcus screens and bar screens and "RandS" loading booms.

The Bertelsen Coal Co., Evansville, has been organized with a capital of $10,000, to deal in coal mines; directors, Jeppe Bertelsen, Katharine Bertelsen and Lowry Bertelsen.

J. R. Wasson, Oakland City, has purchased for $10,000 at a receiver's sale the property of the defunct Muren Mining Co. The property consists of three mines along the Southern Ry., with a daily output of 550 tons. Two of the mines are small slope mines with an output of eighty tons each, but the largest mine is equipped with a tipple and has a production of 400 tons daily.

The General Fuel Corporation, Terre Haute, has increased its capital from $2,000,000 to $2,400,000; $200,000 of the increase is in preferred stock.

The Howe-Coulter Coal Co., anticipating a heavy fall business in coal, has started driving entries in its No. 1 mine at Petersburg. A double shift of 60 men each is employed at the mine, and the work is being divided among the 450 employees of the company. **Many big mines in Pike County, except the strippers,** are operating only one or two days a week. Owing to the cut of $1 a ton on coal, some operators in Pike County say they cannot operate their mines at a profit, but will improve their properties. The stripping mines can handle coal at much less expense than the deep mines, and are operating full time.

The Fort Wayne Board of Works has authorized the city light department **to advertise for bids on 40,000 tons of coal**—the most the city ever contracted for. The city wants shipments to be made every week from May 1, 1923, to April 30, 1924.

At the seventeenth annual meeting and dinner of the Indianapolis branch of the National Metal Trades Association, held April 6, at the Claypool Hotel, Indianapolis, **E. L. Greever,** general counsel for the non-union coal operators' associations of West Virginia, **delivered an address on the open-shop struggle in the coal fields.**

KENTUCKY

The Liberty Coal & Coke Co., Louisville, recently chartered with a capital of $50,000, to operate mines in the Pineville territory, has opened sales offices in the Inyer Southern Building, Louisville. M. S. Barker, A. R. Anderson and R. R. Atkins, of Pineville, are incorporators. The company has production at Bell County mines.

The Young & Morgan Coal Co., Providence, Webster County, capital $12,000, has been incorporated by E. M. Young, J. E. Morgan and Anna B. Young, all of Providence, western Kentucky.

The Howard Elkhorn Coal Co., of Johnson County, capital $36,000, has been incorporated by Paintsville men, including E. G. Howard, of Sublett; L. C. Davidson, of Huntington, W. Va., and H. B. Stanbaugh, of Paintsville.

The Frozen Creek Coal Co., Jackson; capital, $12,000 has been incorporated by S. B. Williams, Elihu Reynolds and M. F. Reynolds.

The Denver Coal Co., Johnson County, capital $50,000, has been chartered by Paris Pelphrey, Alsia Pelphrey and W. L. Pelphrey, all of Denver, Ky.

Thomas C. Fuller, of Lexington, **filed suit for an injunction and accounting** at Frankfort, April 3, in the federal court, claiming **a one-tenth interest in the 120,000 acres of mountain land** sold recently by the F. S. Peabody syndicate, of Chicago, **to the Fordson Coal Co.,** a Henry Ford corporation. The defendants include Harry Payne Whitney, New York; Stuyvesant Peabody, Chicago, trustee of the F. S. Peabody syndicate; Samuel Insull, Chicago; William Wrigley, Jr.; Williams & Peters, Syracuse, N. Y.; the Peabody-Houghteling Co., Chicago; Marks Manufacturing Co., George F. Getz and the Semet-Solvay Co., Chicago; John P. Hopkins, Evanston, Ill., and the Fordson Coal Co.

The I. X. L. Coal & Mining Co., Bell, capital $25,000, has been incorporated by M. D. Bell, F. R. Martin and J. E. Bill, all of Pineville.

The American By-Products Coal Corporation, Bell; capital, $150,000, has been incorporated by M. J. Moss, Pineville; S. M. Loomis and Adolph Levy, Cincinnati.

The White Elkhorn Mining Co., Letcher; capital $25,000; has been incorporated by Thomas Fugate and J. W. Craft, Hazard, and H. A. Price, Detroit, Mich.

The **Tug River Coal Corporation,** capital $5,000, has been incorporated by Hubbard R. Petty, W. E. Caldwell, James Willey and R. H. Lucas.

Coal operators of Perry County, after a long conference with the State Tax Commission **failed to convince the Commission that the assessment of coal lands and mining equipment in Perry County was placed too high.** Members of the commission stated at the close of the conference that the matter had been taken under advise ment but indicated that they were not wavering from their stand for the original assessment. Perry County lands, rich in minerals, were assessed at approximately $19,000,000 this year. This represented an increase of approximately $5,600,000 over the previous assessment. Representatives from Pike County appeared before the commission in the interest of a reduction on the assessment for their county but no agreement was reached. Pike County's assessment of approximately $19,000,000 was raised to $28,000,000.

Development of large areas of virgin coal lands in Butler County is visualized as the result of **the construction of a railroad from Greenville to Rochester,** under a charter granted the Greenville Eastern R.R. Contracts for the construction of 14 miles of the road already have been let. This will be the first railroad in Butler County. The incorporators of the road are J. W. Thompson, of St. Louis; H. E. Barber, of Marion, Ill.; W. J. Lester, of Cleveland; J. L. Rogers and Hubert Meredith, of Greenville.

George R. Dempster of Knoxville, Tenn., president of the Dempster Construction Co., which has obtained the contract to strip and mine coal deposits in Hopkins County, reports that this is **one of the biggest projects in the South** and he estimates that it will take several years to complete the job. The company will work on more than 2,000 acres and will develop the project with steam shovels. Dempster estimates that the company in its operations will remove 100,000,000 cu. yd. of earth and stone and that the tract will yield an estimated output of 16,000,000 tons of coal.

John Hoffman, Judge S. S. Helburn and State Auditor John Craig, all connected with the Hignite Coal Mining Co., were in Louisville recently and called upon President Mapother of the Louisville & Nashville, who **promised them rail connection** with that carrier.

The Rogers Bros. Coal Co., of Ashland, is making preparations to develop its holdings on Turkey Creek, Pike County. The plans of the company will entail the expenditure of more than a million dollars.

K. U. Meguire, of the Harlan Coal Co. interests, Louisville, has arranged to enter the western Kentucky field with **a big stripping operation four miles north of Dawson Springs,** on a new branch of the Illinois Central R.R. from Central City to Madisonville, Ky. Work on this branch line has just started, and development of the mine hardly will start until the railroad reaches the property, and makes it possible to get in steam shovels and equipment by rail. A tipple will be erected with a capacity of 50 to 75 cars per day.

MAINE

The State Fuel Administration was abolished as of April 1, F. R. Wadleigh announces.

MARYLAND

The Black & Decker Mfg. Co., Towson, manufacturer of portable electric tools, announces that **the regular quarterly dividend has been declared on preferred stock,** and that the payment of **dividends on common stock has been resumed,** after having been discontinued for about a year following the recent depression.

MASSACHUSETTS

The State Fuel Administration was abolished on April 1, F. R. Wadleigh states.

The House Committee on Rules voted March 29 **to report with amendments an order** passed by the Senate **for the appointment of a special joint committee to investigate the coal situation.** Changes made centered largely on the question of expense. Under the amended order a committee consisting of three members of the Senate and six members of the House would "investigate the emergency relative to the production, transportation and distribution of coal, with a view to the adoption of such measures as may aid in preventing a recurrence and in securing a continuous and adequate supply of anthracite coal of good quality at reasonable cost and an equitable distribution thereof."

MICHIGAN

To further insure ample coal supply for manufacturing requirements, and to obviate coal shortage delays, etc., **the Ford Motor Co. has purchased 1,000 coal cars** of 55-ton capacity each, to transport coal over the Ford Railways.

MINNESOTA

Federal fuel commissioners are working upon a survey of fuel conditions in the Twin Cities, in order that coal shortages may be averted and prices kept stable in the future. From statements made, it appears that they are likely to recommend warehouses in which to store coal against a shortage. Their investigation will follow the course of coal from the mine to the lower Lake port, thence to the dock, and by rail to the point of consumption. If they are correctly quoted, the warehouses would be established by private capital. It is pointed out in the coal trade that if the plan were economically feasible, private capital, which has already invested millions in docks for the trade of this region, would hardly have refrained from spending a little more, to guard its business.

MISSOURI

The Hannibal Coal Co., of Hannibal, pulled off a new stunt recently when it **shipped more than a ton and a half of coal by parcel post.** The coal was put in white muslin sacks and wrapped in paper, 25 lb. to the sack. The shipment consisted of 147 sacks. The coal shipped was sample fuel and was sent to blacksmiths in Illinois and Missouri. The cost of shipping the coal was $36.03.

The Star Coal Co., of Bevier, **has just signed a contract with the Burlington R.R.** Delivery will start at once. The company recently installed a screen.

MONTANA

A new commercial coal mine is being opened up in the Bird Tail area on the old ranch of J. J. Farrell, Sr., near Fort Shaw. The coal veins, which are of Eagle formation, yield semi-bituminous coal.

NEBRASKA

The Nebraska State Legislature has tendered an **official invitation to Henry Ford to scan that state's water-power possibilities** and to develop the 360,000 horsepower which the government says Nebraska rivers will produce. Harnessing the water-power resources of the state would save 4,000,000 tons of coal annually, and the development of white coal to supplant the chocolate lumps which the state must now import would attract a large population.

NEW YORK

F. R. Wadleigh, Federal Fuel Distributor, is to be the speaker at the luncheon to be held at the Waldorf-Astoria, New York City, on April 12 by the Smokeless Coal Operators' Association.

Coal purchased by the U. S. Shipping Board in New York for its steamship lines **will be inspected and sampled by the U. S. Bureau of Mines.** The work will include sampling of foreign coal remaining in bunker upon the arrival of these ships in New York as well as sampling the coal while it is being loaded on these vessels in the New York port.

Assembly Print No. 2,025, by Assemblyman O'Connor, adds a new section, 2147-a, to the penal law, **prohibiting the sale of ice, coal and wood on Sundays.**

Senate Print No. 1,724, by Senator Fearon, amends Section 225 of the Farms and Markets Law so as **to fix the size of sacks and bags used in the sale of coke, charcoal or kindling wood.**

Burns Brothers announced April 3 that the meeting of stockholders set for April 9, to act upon a proposed readjustment of the capital stock of the company, has been postponed to a date to be fixed later.

C. Tracy Ryan, formerly deputy commissioner of the Tidewater Coal Exchange at New York and recently associated with Dexter & Carpenter at their New York and Boston offices, **is now affiliated with the New York office of the Iron Trade Products Co.**

J. G. Bradley, president Elk River Coal & Lumber Co., Dundon, W. Va.; **George H. Cushing** and **J. D. A. Morrow,** of the Morrow-Callahan Coal Co., Cincinnati, Ohio, **are to make addresses at the annual meeting of the United States Chamber of Commerce,** in New York City, May 8-10. The talks will be before the Chamber's Natural Resources Production group, which will hold a session devoted to discussion of coal problems at the Waldorf-Astoria on the afternoon of May 9. Mr. Bradley's topic will be **"Labor and Its Relation to the Cost of Industrial Coal"**; Mr. Cushing will speak on **"Economic vs. Legislative Method of Settling the Coal Problem,"** and Mr. Morrow's talk will be on **"Some Problems of Coal Distribution."**

NORTH DAKOTA

Vigorous propaganda is being instituted on behalf of the lignite industry of North Dakota, with frequent publicity in which that fuel is credited with possibilities for an industrial development of the Northwest the like of which Pittsburgh never dreamed. Visions are portrayed of the removal of the steel center to the Twin Cities; of developing immense power plants at the scene of the mines, and transmitting power electrically to the Twin Cities, and of briquetting lignite to undercut the price of hard coal with consequent capture of a big domestic market for this fuel.

OHIO

When the Board of Purchase of Columbus opened bids April 4 for 13,000 tons of coal for various city departments for the coming 90 days it was found that Hatton, Brown & Co., Inc., was low on the municipal light plant for 7,200 tons of Hocking nut, pea and slack at $1.60 at the mines. William Harman, a wholesaler, was low on 3,300 tons for the water works department and 200 tons for the garbage reduction plant at $1.43. **It is doubtful if the contracts will be awarded,** as some of the Board of Purchase favor the policy of buying on the open market.

The Steam & Heat Coal Co., Bridgeport, has been chartered with a capital of $100,000 to mine and sell coal in the Pittsburgh No. 8 district. Incorporators are W. E. Thomas, J. C. Heinlein, Jacob Meister, George Meister and Fred Meister.

The Stannard Coal Co., Cleveland, has been incorporated with an authorized capital of $10,000 to mine and sell coal both at wholesale and retail. Incorporators are Max P. Goodman, Mollie Friedman, Meyer Gordon, Charles Auerback and Benjamin F. Sacharow.

The Cincinnati Coal Exchange has voted to invite the Michigan, Ohio and Indiana Retail Coal Dealers' Association to meet in Cincinnati this year. It may be that the meeting will be held at the same time as that of the American Wholesale Coal Association in June.

Papers have been filed chartering the **No. 6 Hocking Coal Mining Co.,** Cannelville, with a capital of 500 shares of no par value, designated by Harold H. Burton and others.

The W. T. & K. Coal Mining Co., Akron, has been incorporated with a capital of $10,000 to mine and sell coal by Murray S. Parker, Orella M. Parker, Teresa Wenst, Alice B. Kraus and J. L. Edwards.

The East Cadiz Coal Co., of Cadiz, has been chartered with a capital of $100,000 to mine coal and deal in coal and coke by John M. Wheeler, Agnes W. Vance, Harry W. Vance, S. B. Hedges and J. W. Reed.

The Margretta Collieries Co., of New Philadelphia, has been incorporated with a capital of $115,000 to operate coal mines, and to buy, sell and deal in coal at retail. Incorporators are H. C. Schneider, Roscoe Oberlin, John C. Thomas, J. W. Edwards and John T. Maurer.

The J. C. Rosso Coal Mining Co., chartered with an authorized capital of $100,000, has been organized by the election as president and manager of J. C. Rosso, a well-known coal mining man from Pittsburgh. An option has been taken on a large tract in the eastern Ohio field, which will be developed. Incorporators are J. C. Rosso, R. H. O'Brien, E. G. Bowerman, H. G. Kates and R. E. Bothwell.

Shipments by river on an unusually large scale are planned by the Cleveland & Western Coal Co. in connection with the opening of a new mine at Powhatan, Ohio, which will rank as one of the largest in the country. With a view to having the most modern facilities for such river shipment, the company has awarded to the General Contracting Corporation of Pittsburgh, Pa., a contract for the construction of a huge tipple, extending out over the river. The company also is arranging for a harbor with capacity for the largest boats and barges.

PENNSYLVANIA

For the part she played in bringing relief to Reilly No. 1 mine at Spangler, Cambria County, on Nov. 8, 1922, when 78 lives were lost and about 35 men were rescued alive through prompt arrival of relief forces, **Miss Mary Agnes McCarthy,** operator for the Bell Telephone Co. at Barnesboro, **has been awarded one of the eight Theodore N. Vail bronze medals** issued in the Pennsylvania-New Jersey division of the Bell company "for conspicuous acts of public service in the telephone industry during 1922." Miss McCarthy's brother-in-law, Martin McAvoy, was killed in the disaster. She went on duty at 8 o'clock in the morning, not knowing of the explosion. She remained on duty throughout the day, directing the messages to and from the mines and called physicians and sent emergency calls to all sections.

A decision by J. W. Brown, a deputy Attorney General, to Joseph J. Walsh, chief of the Department of Mines, holds that it is the duty of a mine operator to keep a headman and footman at their proper places during the entire time any persons are underground and is not permitted to withdraw them after miners are hoisted if any persons are still in the mine.

A series of five bills relating to the mine acts of the state has been introduced in the House by Representative Charles F. Beidelspacher, Lycoming County. One of these amends an act of 1903, creating the State Department of Mines, by providing for fees for examination and qualification of mine foremen and assistants in the anthracite mines. A second bill amends an act of 1901 by providing that it is the duty of the mine inspector to prosecute for violations of the mining law. The third measure provides for the appointment of boards of examiners to examine applicants for certificates of qualification as mine foreman, assistant mine foremen and firebosses in the bituminous coal mines of Pennsylvania and prescribes the qualifications, defining the powers and duties and fixing the compensation of the examiners. Another of the series is a bill amending laws governing the safety of persons employed in the bituminous coal mines. The fifth of this series of bills requires bituminous operators to pay the state the actual cost of foremen's reports and record books which are now furnished by the state.

Eight bills bearing on coal and mining made their appearance during the eleventh hour of the last day for the introduction of measures in the House. It is still possible to introduce legislation in the Senate. Among the bills introduced is one by Representative Richard D. Burns, which would **regulate the sale of anthracite,** fix a standard of clean coal and provide for inspection. **Coal taken from rivers would be taxed** for state purposes **at the rate of 20 per cent of the value** when recovered and dredgers would have to pay a license fee of $25 to the commonwealth under the terms of a bill introduced by Representative J. Ross Horne, Cambria County. Richard Aston, a Luzerne member of the House, sponsored a **bill providing that 50 per cent of the anthracite tax be dedicated to the state,** which now retains all it collects, **and that the other half go to the cities, boroughs and townships where anthracite is mined.**

Auditor General Samuel S. Lewis has announced that because there was a reduction of more than $1,000,000 in the expected revenue from the anthracite coal tax for 1922 and of more than $2,000,000 from the indicated annual yield under normal conditions **a revision of the 1922 reports made to his department by the anthracite producers will be made.** The reduction is indicated by a compilation of the anthracite coal reports for last year for which accounts are now being settled.

The Pinchot administrative code, which reorganizes the state government, **places the State Department of Mines in the Department of Labor and Industry,** making it the mining branch of that department. The code was introduced in the Senate recently. Section 1712 of the code gives the mining branch the same powers the Mining Department now has under existing laws. The examining boards of the Mining Department are placed under the Department of Public Instruction. Section 1309 creates a State Mine Inspectors' Examining Board, which takes over the duties of the Anthracite Mine Inspectors' Examining Board and the Mine Inspection Examining Board.

The House Judiciary General Committee has **reported out affirmatively the Burns bill which would make all coal companies public utilities** and therefore subject to the control of the Public Service Commission. The vote in favor of reporting the bill was 11 to 6. Representative Burns, Philadelphia, sponsor of the measure, appeared before the committee, which held a continued hearing on the bill. He said that coal prices should be regulated just as are those for gas, electric, water and steam service. Opponents of the measure a week prior had contended that coal is not a monopoly like the services the bill's sponsor referred to and that it could not be regulated in the same way.

State Senator P. F. Joyce, Luzerne County, has introduced in the Legislature **a bill modeled along the lines of the Kohler mine-cave law,** which was declared unconstitutional last year. It is designed to protect the lives and safety of persons residing over anthracite mines in cities, boroughs and first-class townships. The measure places in the hands of the chief of the Department of Mines the power to decide whether or not mining shall be carried on in the municipalities covered by the provisions of the bill. Violators of the act would be subject to a fine of $5,000 or imprisonment for a year, or both.

The Pennsylvania Fuel Commission has **rescinded its order of last September controlling deliveries of anthracite** for domestic consumption.

A four weeks' course in coal mining will be given at Carnegie Institute of Technology, according to an announcement from the institution, beginning June 25 and ending July 20. The object of the course is to prepare miners for the examinations of the State Department of Mines for positions as firebosses and mine foreman. At the completion of the work the miners will be awarded certificates by Carnegie Tech, and mine-rescue and first-aid certificates by the U. S. Bureau of Mines. At morning sessions the following subjects will be taught at Carnegie Institute of Technology: Mine laws and regulations, mine ventilation, mine gases, safety lamps, methods of working, mine explosives, timbering and haulage. On afternoons, at the Pittsburgh Experimental Station of the Bureau of Mines, the students will be instructed in mine rescue and first-aid training, coal-dust explosion demonstration at the experimental mine, permissible explosives demonstrations at the experimental mine, lectures on mine safety, etc.

TEXAS

The Texas & Pacific Coal & Oil Co. reports gross earnings of $7,316,287 in 1922, against $9,227,910 in the previous year. After payment of all expenses and reserves for depreciation there was left a balance of $2,077,736 available for the 8,448,048 shares of capital stock of $10 a share par value outstanding, or the equivalent of $2.45 a share. In 1921 the company reported net income of $2,077,519 after the same deductions, equal to $2.46 a share.

UTAH

The Columbia Steel Corp. has acquired title to 312 acres of coal land in Carbon County by a cash settlement of approximately $740,000 on the purchase contract. The property involved adjoins the Sunnyside coking deposits of the Utah Fuel Co. on the north and has been pronounced by experts to be good coking coal.

WASHINGTON

To promote greater co-operation among retail dealers and that they may understand the processes involved in the production of briquets, the **Pacific Coast Coal Co. was host to 150 outside dealers** March 22 on a sightseeing trip through its plants in the vicinity of Seattle. The trip concluded with a banquet at the Frye Hotel in the evening. Dealers from every section of the state were members of the party.

WEST VIRGINIA

Eight houses, the store and the mine office of the Soper-Mitchell Coal Co., operating at Scott's Run, in the Monongahela field, **were destroyed by fire** on March 24, and the tipple partly damaged, though not sufficiently to halt operations at the mine. The fire was started by an overheated stove in a dwelling occupied as bachelor quarters by six miners. A house belonging to the Diamond Fuel Co. also was destroyed. Only heroic work upon the part of the miners employed at the Soper-Mitchell plant saved the tipple from destruction.

A freight wreck at Eggleson Tunnel on the Virginian Ry. late in March caused **a total suspension of the movement of coal freight** for several days. Eighteen carloads of coal piled up in the tunnel and it was necessary to detour passenger trains over the Norfolk & Western, no attempt being made to move any freight.

Complete figures covering every phase of mining in West Virginia for the fiscal year ending June 30, 1922, though not so far printed, have been compiled by the West Virginia Department of Mines, the following table affording a summary of such mining activities in the state, for the period given (figures for coal representing gross tons and for coke net tons):

Counties in which coal is mined on a commercial scale	35
Firms operating on a commercial scale	888
Openings of all kinds subject to the mining law	1,381
Coal pick mined from commercial mines, tons	15,565,016
Coal machine mined from commercial mines, tons	54,623,187
Total tons of coal from commercial mines	70,188,203
Estimated tons of coal from small mines	700,000
Total tons of coal from all mines	70,888,203
Coal converted into coke, tons	296,151
Coke manufactured, tons	175,156
Total value of coal at the mines	$180,764,917.65
Total value of coke manufactured	$1,026,414.16
Value of a ton of coal at the mines	$2.55
Value of a ton of coke at the ovens	$5.86
Number of mining machines in use	3,434
Average number of coke ovens in use	750
Days mines were in operation	131
Days ovens were in operation	146
Pick miners employed in commercial mines	14,161
Machine operators and miners employed in commercial mines	44,070
Underground laborers in commercial mines	30,700
Outside employees connected with commercial mines	18,517
Coke employees	261
Persons employed at commercial mines and coke ovens	107,709
Persons killed	330
Persons injured non-fatally	542
Persons employed for each man killed	326
Persons employed for each man injured	199
Tons of coal mined in commercial mines for each fatality	214,813
Tons of coal mined in commercial mines for each non-fatality	127,100
Number of wives left widows	182
Number of children left fatherless	450
Acres of coal worked out	8,795
Tons of coal produced in commercial mines, per miner, pick and machine miners included	1,205
Average earnings of each pick miner, per year	$1,099.10
Average earnings of each pick miner per month	$91.59
Average price per ton of mining run-of-mine coal	$0.95

WISCONSIN

B. M. Ainesworth has been elected president of the **newly formed Valley Coal & Dock Co.,** 373 Broadway, Milwaukee. Other officers named were R. L. Clements, general manager; F. F. Kiegel, treasurer; J. F. Sweeney and F. H. Baker, directors. The new company, which has absorbed the old Valley Coal Co., began operations under the new organization on March 31 with a capital of $250,000.

The Industrial Coal & Dock Co., Milwaukee, 1,000 shares common stock without par, has been incorporated by J. Gilbert Hickox, Leo Mann and Walter C. Ferris.

WASHINGTON, D. C.

Those in attendance at the recent **annual meeting of the Joseph T. Holmes Safety Association,** held in Washington, were Dr. H. Foster Bain, Director U. S. Bureau of Mines and president ex officio; Edgar Wallace, American Federation of Labor; Dr. David T. Day, American Mining Congress; E. H. Denny, J. O'Leary, United Mine Workers of America; Dr. George K. Burgess, American Society for Testing Materials; Major M. J. Shields, American Red Cross; Dr. David White, National Academy of Sciences; John H. Finney, American Institute of Electrical Engineers; Gen. W. H. Bixby, American Society of Mechanical Engineers; George S. Rice, American Institute of Mining and Metallurgical Engineers; J. W. Paul, Mine Inspectors' Institute; Dr. J. J. Rutledge, Geological Society of America; Dr. Andrew Stewart, American Chemical Society; F. J. Bailey and Dr. R. B. Sayers, U. S. Bureau of Mines.

The U. S. Navy will open bids April 18 at noon for the following quantities of **bituminous or semi-bituminous coal** for ships: 12,000 gross tons at New York, delivery from May 1, 1923, to June 30, 1924; 3,000 gross tons at Philadelphia, delivery from July 1, 1923, to June 30, 1924; 425,000 gross tons at Hampton Roads, delivery from July 1, 1923, to June 30, 1924; 50,000 gross tons at Baltimore, delivery from July 1, 1923, to June 30, 1924; 200,000 gross tons at Sewalls Point, Va., 50,000 tons to be delivered prior to July 1, 1923, and remaining 150,000 tons prior to Nov. 1, 1923.

CANADA

Harvard Stutchbury, trade commissioner for Alberta, is in Toronto on a mission for the opening up of a market for Alberta coal in Ontario. The Ontario government has appointed a committee to receive and distribute shipments of Alberta coal during the coming season and **a demonstration of its burning and treating qualities will be given** as early as possible under the direction of G. R. Pratt, fuel engineer for the Alberta government.

A plan for the exportation of coal from Mexico to Canada which would be beneficial to both countries has been submitted to the Fuel Commissioner at Ottawa by L. F. Bustamente, Mexican commercial agent in Canada.

Recent Patents

Mining and Loading Machine. N. D. Levins, Columbus, Ohio, assignor to the Jeffrey Mfg. Co., Columbus, Ohio, 1,437,526. Dec. 5, 1922. Original application filed Jan. 13, 1917; serial No. 142,324. Divided and this application filed Jan. 20, 1919, serial No. 272, 115; renewed March 2, 1922, serial No. 540,572.

Coal Screening and Washing Machine. Wm. F. Martin, Wormleysburg, Pa.; 1,437,669. Dec. 5, 1922. Filed May 18, 1922; serial No. 561,978.

Coal Screening and Washing Machine. Wm. F. Martin, Harrisburg, Pa.; 1,438,125. Dec. 5, 1922. Filed May 18, 1922; serial No. 561,979.

Obituary

C. S. Williamson, formerly of the Meade-Morrison Manufacturing Co., who had a great deal to do with the designing and installation of modern coal machinery at Milwaukee and other leading upper lake ports, died in Chicago on Saturday, March 31, 1923.

Albert H. Tracy, 83 years old and active in the city coal trade of Buffalo, died on April 3, after a short illness. He was long in the trade, being superintendent of the Delaware & Hudson water-shipping trestle several years, till the company went out of business at Buffalo. He was well known, an active worker in church and in general benevolent enterprises. He leaves a wife and three daughters. His son and namesake, manager of the Tracy Coal & Wood Co., died several years ago.

Traffic News

On account of accumulation **an embargo was placed April 6 by the New York Central R.R.** against the acceptance of all carload and less carload freight from connections at 60th Street or 68th Street, New York City, Weehawken, National Junction, or Harsimus Cove, for points on or via the Boston & Albany R.R., except livestock, perishable freight, flour, dees for livestock, anthracite coal, fertilizer or fertilizer materials including agricultural lime, pulverized lime, limestone, phosphate rock, field and garden seeds when in packages, sacks or bags, spraying materials, spraying machinery, agricultural implements required for planting purposes, Boston & Albany Railroad fuel, material and supplies, freight consigned to offices of the U. S. Government and shipments covered by permits issued by C. J. Brister, assistant vice president, New York Central Lines, Chicago, Ill., or G. C. Woodruff, general freight agent, New York Central R.R., New York City,

On account of an accumulation **an embargo** was placed March 31 by the **Philadelphia & Reading Ry. against all carload freight** destined to 22nd and Allegheny Ave. Station, Philadelphia, Pa., consigned to John J. Davies & Co., R. D. Letterle, F. R. Philip and Edward Morris.

According to well-authenticated reports, **the Virginian Ry. will extend its line** from Elmore, W. Va., down the Guyan River to or near Pineville, in Wyoming County, W. Va. In fact **both the Virginian and the Chesapeake & Ohio have made surveys of proposed routes** along the river and both have obtained rights of way that conflict at some points for some distance below Pineville. A survey of the proposed route and an application to construct the railway have been filed with the Public Service Commission at Charleston, and it is understood that the Virginian will soon invite bids for the construction of the proposed extension. There also is the possibility that the company will extend its line beyond Pineville and traverse Wyoming and Logan counties to a terminal near Huntington.

Heavy coal movement last year was a primary factor in Norfolk & Western Railway Co., **gross revenues of $90,352,887, the largest in the road's history,** according to the report for 1922. In 1921 gross amounted to $80,718,802, while operating expenses rose from $64,346,857 to $68,052,304 last year. Balance available for dividends, after deductions for rentals, interest and miscellaneous charges totaled $14,554,989, equal after preferred dividends to $10.66 a share on the $127,826,900 outstanding common stock. In 1921 net was $10,043,-181, or $7.50 a share on the $121,519,700.

The Norfolk & Western R.R. has ordered 25 Mallet locomotives for use in all divisions of its lines, principally in hauling coal. These engines, weighing 536,000 lb. and having a pulling capacity of 7,000 tons, will aid in taking care of the lake trade this season.

The Interstate Commerce Commission has set June 14 as the date on which **to hear oral arguments in the following coal cases:** Illinois Coal Traffic Bureau vs. Chicago & Northwestern R.R.; Northwestern Coal Dock Operators' Association vs. Chicago & Alton R.R.; C. Reiss Coal Co. vs. Ahnapee & Western R.R.; Traffic Bureau of the Sioux City Chamber of Commerce vs. the Baltimore & Ohio R.R.

The following embargoes have been cancelled: Coal via New York Central for United Hudson Electric R.R. Co., Catskill, N. Y.; Bituminous coal via New York Central for Superior Fuel Co., at all New York City stations; all freight via Boston & Maine for Cunningham Grain Co., Oak Grove, Mass.; all freight via New York Central for Staten Island Rapid Transit Railway.

On account of accumulation and to prevent congestion due to inability of the N. Y., N. H. & H. R.R. to take from B. & A. R.R. currently cars for delivery in their Boston switching limits **an embargo was placed April 3 by the Boston & Albany R.R.** against all carload freight from connecting lines at Albany, West Albany Transfer and Rensselaer, N. Y., intended for public deliveries or private sidings on the N. Y., N. H. & H. R.R. at Boston, Mass., Army Supply Base, Bird Street, Commonwealth Pier No. 5, Dudley St., Harvard St., South Boston Terminals Boylston St., Forest Hills, Harrison Square, Roxbury, Mass., when routed via Framingham or Boston, Mass. No exceptions and all outstanding J. O. Halliday permits covering cars for those destinations will not be honored.

On account of line being discontinued **an embargo was placed April 3 by the Bangor & Aroostook R.R.** on all shipments, carload and less carload, destined from Works, North Brownsville and Gould Siding, Maine.

On account of advices received from the Central New York Southern R.R. dated April 2, 1923, as to possible supension of operation effective at once, **The New York Central R.R. embargoes** all carload or less carload freight consigned to points on the Central New York Southern R.R., except shipments tendered by shipper and accepted by the railroad on the basis of "at shipper's risk on account of failure of connecting carrier at Auburn to accept and transport beyond New York Central R.R."

The Alexandria Paper Co., of Alexandria, Ind., has **attacked the rate on bituminous coal from Springfield, Ill., to Alexandria.**

Batchelor & Barlow, of Sharpesville, Ind., have filed **complaint against the rate from Springfield to Sharpesville.** Similar complaints have been filed against the rate from Springfield to various Indiana points.

The Consumers' Fuel & Ice Co., of Watertown, S. D., has **complained against the rate on coal from Herrin, Ill., to Watertown.**

Joseph Bancroft & Sons, of Wilmington, Del., has filed a **complaint based on rates from certain producing points in Pennsylvania to Wilmington.**

Stockholders of the **Hocking Valley R.R.,** meeting at Columbus, Ohio, April 3, **elected the following directors:** O. P. and M. J. Van Sweringen, C. L. Bradley, J. J. Bernet, W. A. Colston, Otto Miller, J. R. Nutt, J. B. Zerbe, all of Cleveland; F. R. Hunting, Columbus; Jeremiah Milbank, New York City; Thomas J. Davis, Cincinnati, and W. J. Harahan, Richmond, Va.

On account of accumulation **an embargo was placed March 29 by the New York Central R.R.** against all freight consigned, reconsigned or intended for the Rogers Milk Corporation, Boonville, N. Y.

An embargo placed by the **Susquehanna & New York R.R.** against freight destined to points on the Hillsgrove Tram R.R. **was entirely cancelled March 29.**

Certain shipments of coal from Higginsville and Macon, Mo., and Cornell, Kan., to Argentine, Kan., **are found to have been overcharged** in a tentative report made to the Interstate Commerce Commission by its examiner. The overcharge was found to have been 40c. per net ton.

A report by examiner Carter of the I. C. C. finds that the **Cambria Steel Co.,** of Johnstown, Pa., **was charged an unreasonable rate on the movement of 61 cars of coal** from Pennsylvania points to Johnstown. The rates were found unreasonable to the extent that they exceeded commodity rates subsequently established.

The Interstate Railroad Co., now completing a new line running from Norton, Va., to a connection with the Carolina, Clinchfield & Ohio system, has asked for authority **to issue $1,057,756 in new capital stock,** which it purposes to sell at par, the funds to be used to complete its building project, to pay off existing indebtedness, and to reimburse the road's treasury for expenditures made upon it.

The Kanawha & West Virginia R.R. and the New York Central have applied to the Interstate Commerce Commission for authority **to construct an extension** of the line of the former road from its present terminus at Swiss, eastwardly up the Gauley River to the mouth of Meadow River, a distance of twenty miles, thence southwesterly up Meadow River to a connection with the Sewel Valley R.R., near Nallen, a distance of nine miles. It also is proposed to build a branch line at a point eight miles above Swiss to extend northwestwardly up Peters Creek to Line Creek, a distance of four miles.

Association Activities

Hazard Coal Operators Association

The Executive Committee of the Hazard Coal Operators Association met at the Gibson Hotel in Cincinnati on April 3 and went over many items that were of an association nature—among which was car allotments that would be expected from the Louisville & Nashville and traffic conditions and betterments that had been promised by that line. Informal discussions were made after the meeting by members concerning the pooling of coal from Hazard for handling over the docks at the Head-of-the-Lakes. Intimation was given that it might be possible to lease dock space or forward coal to dock concerns for handling on a straight unloading cost plus a selling commission.

Cincinnati Coal Exchange

At the regular monthly meeting and luncheon of the Cincinnati Coal Exchange, April 5, Thomas L. Lewis, secretary of the New River Operators' Association, was the speaker. Mr. Lewis declared that "politicians were the curse of this country" and that their meddling with business caused distress to the consumers. He lit into the Interstate Commerce Commission and said that its members were only human. Lewis said that he feared that the **findings of the President's Coal Commission would result in the formation of a permanent coal commission** modeled along the line of the Interstate Commerce Commission "And then God help this country."

Coming Meetings

National Association of Purchasing Agents will hold its eighth annual convention and Informashow at Cleveland, Ohio, May 15-18. Convention headquarters, room 219, Hotel Winton, Cleveland.

The National Association of Manufacturers will hold its 27th annual convention at the Waldorf-Astoria, New York City, May 14-16.

New England Coal Dealers' Association will hold its annual meeting at Providence, R. I., June 13-15. Secretary, C. R. Elder, Boston, Mass.

National Retail Coal Merchants' Association will hold its sixth annual convention June 25, 26 and 27 at Scranton, Pa., with headquarters at the Hotel Casey. The registration fee of $15 will include all meals except breakfast, transportation to and from the mines which will be visited, and the banquets. The only other expenses to be incurred will be hotel room and transportation to and from Scranton. Executive secretary, J. E. O'Toole, Philadelphia, Pa.

National Safety Council will hold its twelfth annual safety convention at the Buffalo Statler Hotel, Buffalo, N. Y., Oct. 1-5. Managing director and secretary, W. H. Cameron, 168 No. Michigan Ave., Chicago, Ill.

International First-Aid and Mine-Rescue meet will be held Aug. 27-29, at Salt Lake City, Utah.

American Institute of Electrical Engineers will hold its annual convention June 25-29, at Swampscott, Mass. Secretary, F. L. Hutchinson, 29 West 39th St., New York City.

Coal Mining Institute of America will hold its annual meeting Dec. 19, 20 and 21 at Pittsburgh, Pa. Secretary, H. D. Mason, Jr., Chamber of Commerce Building, Pittsburgh, Pa.

The Virginia Coal Operators' Association will hold its annual meeting on April 21 at Norton, Va. Secretary, G. D. Kilgore, Norton, Va.

International Railway Fuel Association will hold its spring convention at the Hotel Winton, Cleveland, Ohio, May 21-24. Secretary-treasurer, J. G. Crawford, Chicago, Ill.

The American Mining Congress will hold its twenty-sixth annual convention in conjunction with the **National Exposition of Mines and Mining Equipment,** Sept. 24-29, at the Milwaukee Auditorium, Milwaukee, Wis. Secretary, J. F. Callbreath, Washington, D. C.

Indiana Retail Coal Merchants' Association will hold its annual meeting April 25 and 26 at the Claypool Hotel, Indianapolis, Ind. Secretary, R. R. Yeagley, Indianapolis, Ind.

American Society for Testing Materials will hold its annual meeting at the Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., beginning June 25 and continuing throughout the week. Secretary, E. Marburg, Philadelphia, Pa.

The Colorado & New Mexico Coal Operators' Association will hold its annual meeting June 20 at Denver, Col. Secretary, F. O. Sandstrom, Denver, Col.

The Electric Power Club's annual meeting will be held at the Homestead, Hot Springs, Va., June 11-14. Executive secretary, S. N. Clarkson, Cleveland, Ohio.

National Foreign Trade Council will hold its annual conference May 2-4 at New Orleans, La. Secretary, O. K. Davis, 1 Hanover Square, New York City.

The eleventh annual meeting of the Chamber of Commerce of the United States will be held in New York City May 7-10.

National Coal Association will hold its sixth annual convention June 19-22 at Atlantic City, N. J. Assistant secretary, C. C. Crowe, Washington, D. C.